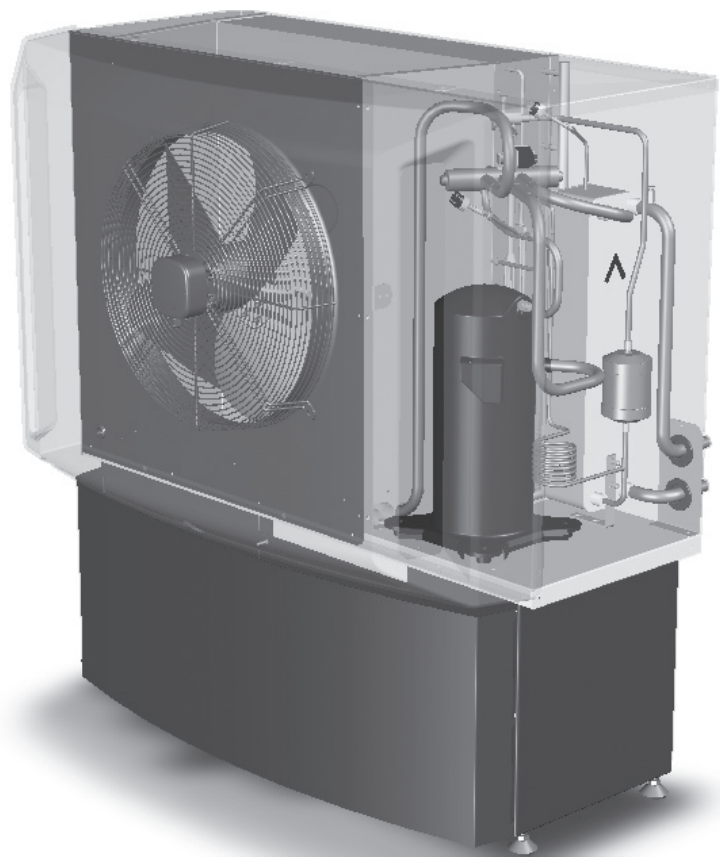




Danfoss DHP-AX

Installation and Service instructions



These instructions are valid for the following model of Danfoss heat pump:
DHP-AX

If these instructions are not followed during installation and service, Danfoss AS's liability according to the applicable warranty is not binding.

Danfoss AS retains the right to make changes to components and specifications without prior notice.

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1 About the instructions

1.1 Introduction

These instructions are split into two parts: installation instructions and service instructions.

The installation instructions start by describing DHP-AX data. The installation instructions later give instructions in a logical order covering unpacking, installation procedure, and checking the installation.

The service instructions contain information about the heat pump's function and control. The service instructions also contain a complete menu description and covers troubleshooting in-depth.

The first two sections, *1 About the instructions* and *2 Safety precautions* are general sections and apply to all the instructions, i.e. the installation instructions and service instructions.

References to chapters and sections within the instructions are in italics, e.g.: *1 About the instructions*.

References to menu options in the heat pump's control system are in upper case, e.g.: INFORMATION -> OPERAT. -> AUTO.

All figures in the instructions are numbered to help installers and service technicians refer to them easily.

1.2 Symbols

The instructions contain different warning symbols, which, together with text, indicate to the user that there are risks involved with actions to be taken.

The symbols are displayed to the left of the text and three different symbols are used to indicate the degree of danger:



Hazardous electrical voltage! Indicates an immediate danger that **leads to fatal or serious injury** if necessary measures are not taken.



Danger! Risk of personal injury! Indicates a possible danger that **can lead to fatal or serious injury** if necessary measures are not taken.



Risk of installation damage. Indicates a possible hazard that can lead to item damage if necessary measures are not taken.

A fourth symbol is used to give practical information or tips on how to perform a procedure.



Information regarding making the handling of the installation easier or a possible operational technical disadvantage.

1.3 Terminology

The instructions contain terms throughout that designate components and functions. The table lists the most common terms that are used in the instructions.

Term	Meaning
Heating system	The circuit that generates heat to the property or to the water heater.
Supply line	The heating system's supply line with flow direction from the heat pump to radiators/under floor heating or water heater.
Return line	The heating system's return line with flow direction from radiators/under floor heating or water heater to the heat pump.
Circulation pump	Circulation pump for heating system.
Refrigerant circuit	The energy carrying circuit between outdoor air and heating system.
Refrigerant	The gas/liquid that circulates in the refrigerant circuit.

2 Safety precautions

2.1 General safety precautions



The heat pump must be installed by authorised installation engineers and the installation must follow the applicable local rules and regulations as well as these installation instructions.



This apparatus is not intended for persons (including children) with reduced physical, sensory or psychological capacity, or who do not have knowledge or experience, unless supervised or they have received instructions on how the apparatus functions from a safety qualified person.



Danger! Risk of personal injury! Children are not permitted to play with the apparatus.



The heat pump must be positioned outdoors on a stable base. The floor must be able to support the gross weight of the heat pump. (see Technical Specification)



To prevent leaks ensure that there are no stresses in the connecting lines!



It is important that the heating system is bled after installation.



Bleed valves must be installed where necessary.



Radiator systems with closed expansion tanks must also be supplied with approved pressure gauges and safety valves.



Cold and hot water pipes and overflow pipes from safety valves must be made of heat resistant and corrosion-resistant material, e.g. copper. The safety valve overflow pipes must have an open connection to the drain and visibly flow into this in a frost-free environment.



The connecting pipe between the expansion tank and the safety valve must slope continuously upwards. A continuous upwards slope means that the pipe must not slope downwards from the horizontal at any point.

2.2 Refrigerant

Although the heat pump cooling system (refrigerant circuit) is filled with a chlorine-free and environmentally-approved refrigerant that will not affect the ozone layer, work on this system may only be carried out by authorized persons.

2.2.1 Fire risk

The refrigerant is not combustible or explosive in normal conditions.

2.2.2 Toxicity

In normal use and normal conditions the refrigerant has low toxicity. However, although the toxicity of the refrigerant is low, it can cause injury (or be highly dangerous) in abnormal circumstances or where deliberately abused.



Danger! Risk of personal injury! Spaces in which heavy vapour can collect below the level of the air must be well ventilated.

Refrigerant vapour is heavier than air and, in enclosed spaces below the level of a door for example, and in the event of leakage, concentrations can arise with a resultant risk of suffocation due to a lack of oxygen.



Danger! Risk of personal injury! Anyone with symptoms of poisoning from the vapour must immediately move or be moved into the fresh air.



Danger! Risk of personal injury! Refrigerant exposed to a naked flame creates a poisonous irritating gas.

This gas can be detected by its odour even at concentrations below its permitted levels. Evacuate the area until it has been sufficiently ventilated.

2.2.3 Work on the refrigerant circuit



Work on the refrigerant circuit must only be carried out by a certified engineer!



When repairing the refrigerant circuit, the refrigerant must not be released from the heat pump, it must be treated in the applicable way.

Draining and refilling must only be carried out using new refrigerant (for the amount of refrigerant see manufacturer's plate) through the service valves.



All warranties from Danfoss are void if, when filling with refrigerant other than Danfoss AS recommended refrigerant, it has not been notified in writing that the new refrigerant is an approved replacement refrigerant together with other remedies.

2.3 Scrapping



When the heat pump is to be scrapped the refrigerant must be extracted for destruction. Local rules and regulations related to the disposal of refrigerant must be followed.

2.4 Electrical connection



Electrical installation may only be carried out by an authorized electrician and must follow applicable local and national regulations.



The electrical installation must be carried out using permanently routed cables. It must be possible to isolate the power supply using an all-pole circuit breaker with a minimum contact gap of 3 mm.



Hazardous electrical voltage! The terminal blocks are live and can be highly dangerous due to the risk of electric shock. All power supplies must be isolated before electrical installation is started. The heat pump is connected internally from the factory, for this reason electrical installation consists mainly of the connection of the power supply.



The room temperature sensor is connected to a safety extra-low voltage.

Follow the separate installation instructions for the room temperature sensor!

2.5 Commissioning



The installation may only be commissioned if the heating system is filled and bled. Otherwise the circulation pump can be damaged.



If the installation is only to be driven by an auxiliary heater during the installation, ensure that the heating system is filled and the compressor cannot be started. This is carried out by setting the operating mode to AUX. HEATER. For further information see chapter 11, Start-up and trimming.

Installation instructions

3 Heat pump information

3.1 DHP-AX

3.1.1 Dimensions and connections

The stand shown in the image is an accessory.

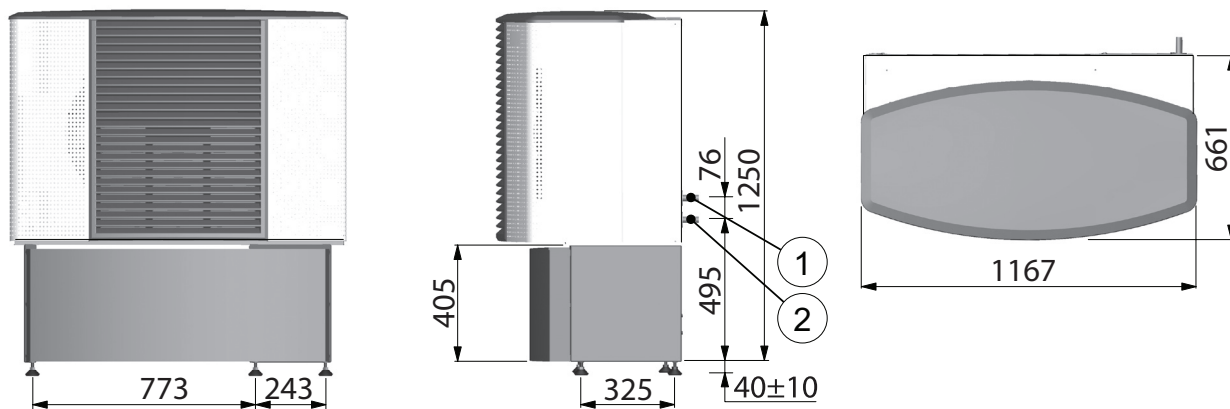


Figure 1: DHP-AX, dimensions and connections.

Position Name

- | | |
|---|--|
| 1 | Supply line heating system, DHP-AX 6, 8, 10: 22 Cu, DHP-AX 12: 28 Cu |
| 2 | Return line heating system, DHP-AX 6, 8, 10: 22 Cu, DHP-AX 12: 28 Cu |

3.1.2 Components

The component image below shows diagrammatically how the heat pump looks inside. There may be differences between different versions.

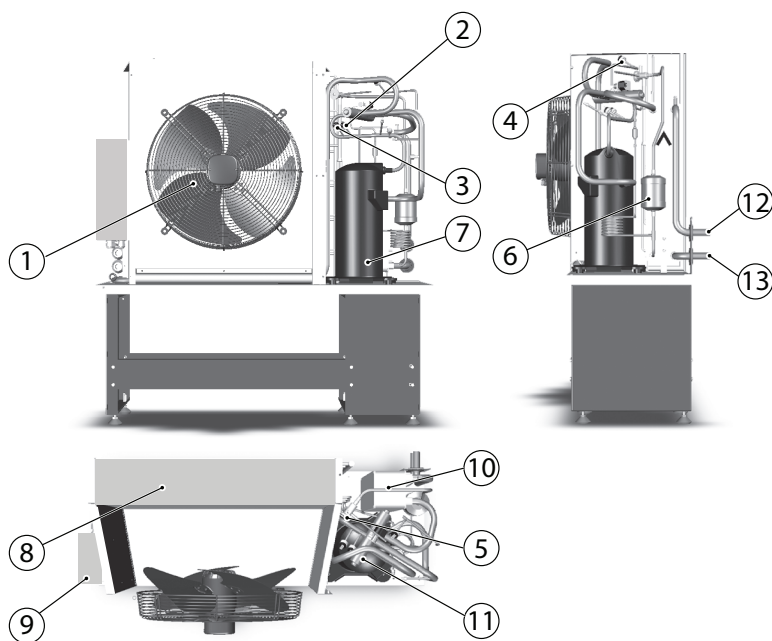


Figure 2: Components in DHP-AX.

Position Name

- | | |
|----|----------------------------|
| 1 | Fan |
| 2 | Operating pressostat |
| 3 | High pressure pressostat |
| 4 | Low pressure pressostat |
| 5 | 2-way expansion valve |
| 6 | Drying filter |
| 7 | Compressor |
| 8 | Air heat exchanger |
| 9 | Electrical cabinet |
| 10 | Condenser |
| 11 | Four way valve |
| 12 | Heating system supply line |
| 13 | Return line heating system |

3.2 Technical data DHP-AX

Air to water heat pump	DHP-AX		6	8	10	12
Refrigerant	Type		R407C	R407C	R407C	R407C
	Amount	kg	1,6	1,6	2,5	2,7
	Test pressure	MPa	3,4	3,4	3,4	3,4
	Design pressure	MPa	3,1	3,1	3,1	3,1
Compressor	Type		Scroll	Scroll	Scroll	Scroll
	Oil		POE	POE	POE	POE
Electrical data 3-N~50Hz	Main supply	Volt	400	400	400	400
	Rated power compressor	kW	2,0	2,3	3,6	4,4
	Rated power, fan	kW	0,3	0,3	0,3	0,3
	Start current	A	16	17	22	22
	Circuit breaker	A	10	10	16	16
Electrical data 1-N~50Hz	Main supply	Volt	230	230	230	230
	Rated power compressor	kW	3,3	4,2	5,4	5,7
	Rated power, fan	kW	0,3	0,3	0,3	0,3
	Start current	A	56	76	97	108
	Circuit breaker	A	20	20	25	32
Performance ⁶	COP ¹		4,37	4,47	4,47	4,26
	COP ²		3,81	3,99	4,05	3,81
	Heating capacity ²	kW	6,20	7,93	10,2	11,2
	Power input ²	kW	1,6	2,0	2,5	2,9
Nominal flow ³	Heating circuit	l/s	0,3	0,4	0,5	0,5
Lowest outdoor temperature allowed for compressor start		°C	-16	-16	-16	-16
Max temperature ⁴	Heating circuit	°C	60	60	60	60
Pressure switches	Low pressure	MPa	0,03	0,03	0,03	0,03
	Operating	MPa	2,85	2,85	2,85	2,85
	High pressure	MPa	3,10	3,10	3,10	3,10
Water volume	Condensor	l	1,3	2,2	2,7	2,7
Number of units			2	2	2	2
Outdoor unit	Dimensions LxWxH	mm	661x1167x1290	661x1167x1290	661x1167x1290	661x1167x1290
	Weight	kg	108	113	123	140
	Sound power level ⁵	dB(A)	67,7	67,8	68,1	70,4
	Fan speed	rpm	890	890	890	940
	Air flow	m³/h	3667	3667	3667	4045
Control unit	Dimensions LxWxH	mm	210x380x600	210x380x600	210x380x600	210x380x600
	Weight	kg	18	18	18	18

The measurements are performed on a limited number of heat pumps which can cause variations in the results. Tolerances in the measuring methods can also cause variations.

¹⁾ At A7W35 Δ10K warm side.

²⁾ At A7W35 according to EN 14511.

³⁾ Nominal flow; heating circuit Δ10K.

⁴⁾ At minimum outdoor temperature 0 °C.

⁵⁾ According to ISO 3741.

⁶⁾ The values apply to a new heat pump with clean heat exchangers.

3.3 Supplied contents

3.3.1 Control

1. Check that there is no transport damage.
2. Remove the packaging and check that the delivery, except for the heat pump, contains the following components.

3.3.2 Heat pump

Quantity	Name			
1	Heat pump			
1	Flow sensor			
	Size	Name	Color Code	l/m
	6kW	UR1-025TC-15	Black	7
	8kW	UR1-025TC-14	Yellow	10
	10kW	UR1-025TC-13	Red	12
	12kW	UR1-025TC-16	Blue	14

3.3.3 Packaging

Quantity	Name
1	Dirt filter with shut-off DN25
1	Outdoor sensor
1	Safety valve 1,5 bar 1/2"
1	Front cover
1	Control centre
1	4 m Supply line sensor

3.3.4 Document set

Quantity	Name
1	Installation and service instructions
1	User manual
1	Electrical instructions
1	Decal sheet
1	Registration card (only for certain markets)

3.4 Transporting the heat pump



The heat pump must always be transported and stored standing and in a dry environment. If the heat pump is laid on the incorrect side it may become seriously damaged as the oil in the compressor can run out in the pressure pipe and therefore prevent normal function.



Always secure the heat pump so that it cannot tip over during transportation.

3.5 Space requirement



To ensure the function of the heat pump, there must be at least 300 mm of space behind and 1500 mm at the front.



For maintenance work there must be approximately 300 mm of space at the sides.

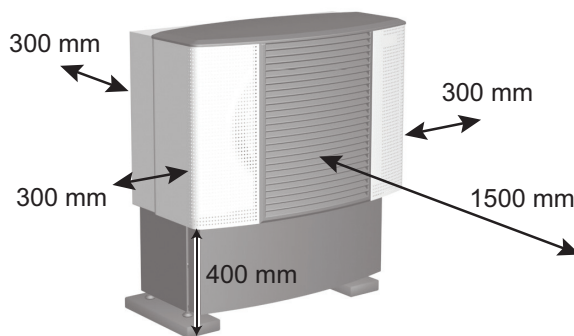


Figure 3: Necessary service space for DHP-AX.

4 Unpacking and installation

4.1 Assembling the stand (accessory)



NOTE! Only place the heat pump on its short side as shown in the figure below, otherwise there is a risk of damaging it.



NOTE! All panels (except the front cover) must be installed on the heat pump.

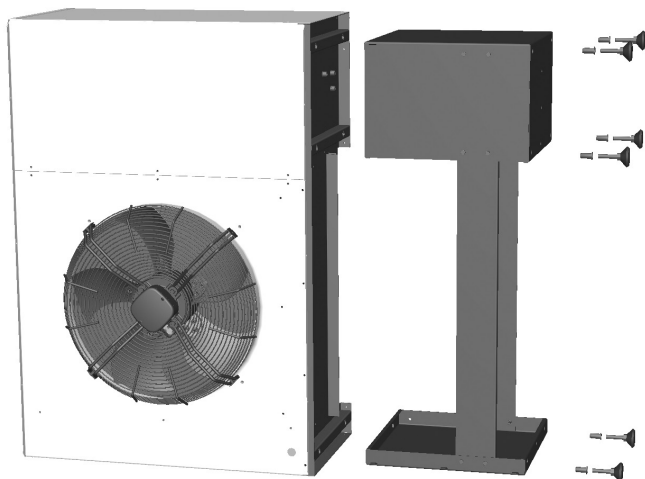


Figure 4: The heat pump can be placed on its short side for short periods of time.

1. Place the heat pump on its short side as shown in the figure above.
2. Remove the adjustable feet (six) if the stand is to be used.
3. Screw the two horizontal struts (1) in the two ends (2) with the grooves (4) turned as illustrated below. Use 8 x M6x10 screws. The curved edges of the horizontal struts must be facing inwards.

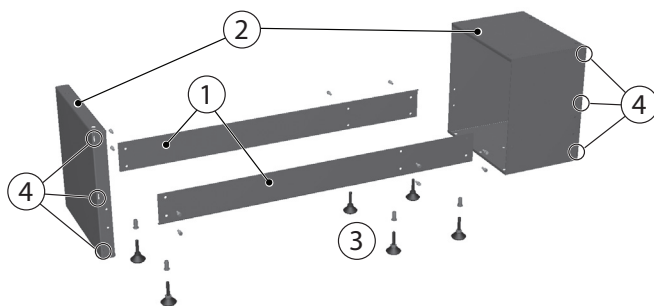


Figure 5: Assembling the stand.

4. Screw the adjustable feet (3) into the holes under the ends.
5. Install the entire stand on the heat pump.
6. Carefully stand the heat pump up so that it is on the stand.

4.2 Positioning the heat pump

When positioning the heat pump, note the following:



The heat pump must be positioned some distance away from the ground as the defrost function can cause ice build-up. It must be positioned on a stand (accessory) or suspended from wall brackets.



When the heat pump is defrosting, water will drip straight down under the unit. The area around the heat pump must therefore be correctly drained in order to catch the water (approximately 2 litres per defrost). A drip tray (accessory) that collects and leads the melt water away can be installed.



The heat pump's adjustable stand must be positioned on a secure base such as wooden sleepers, paving slabs or cast footings.



The heat pump has six adjustable feet that must be adjusted to compensate for irregularities in the surface on which it is sitting. All feet must be in contact with the underlying surface. If the surface is so irregular that the feet cannot compensate for it, the installation engineer must remedy this.



The heat pump must be positioned horizontally, which is checked with a spirit level.



The heat pump does not have to be positioned in any specific direction.



Noise is produced from the heat pump when the fan and compressor are in operation, remember this when positioning to reduce disturbance in your own home as well as to any neighbours.



Remember that the heat pump must have a certain amount of room in order to function and for servicing, see section 3.5 *Space requirement*.

1. Move the heat pump to the installation site.
2. Position the heat pump where desired.
3. Adjust all six feet so that they are in contact with the underlying surface and so that the heat pump is level.
4. Attach the supplied decals with the correct language over the existing decals.

5 Piping installation



NOTE! To prevent leaks, ensure that there are no stresses in the connecting pipes!



NOTE! It is important that the heating system is bled after installation. Bleed valves must be installed where necessary.



Piping installation must be carried out in accordance with applicable local rules and regulations. The hot water tank must be equipped with an approved safety valve (supplied).



The pipes between the heat pump various units should be isolated.



Ensure that the piping installation follows the dimension and connection diagrams in Section 3 Heat pump information.



The position lists show the components and parts included in the delivery in *italics*.



Radiator systems with closed expansion tanks must also be supplied with approved pressure gauges and safety valves.



Cold and hot water pipes as well as overflow pipes from safety valves must be made of heat resistant and corrosion-resistant material, e.g. copper. The safety valve overflow pipes must have an open connection to the drain and visibly flow into this in a frost-free environment.



The connecting pipe between the expansion tank and the safety valve must slope continuously upwards. A continuous upwards slope means that the pipe must not slope downwards from the horizontal at any point.

5.1 System solution

In a VL system the heat pump can produce both heating and hot water with the compressor and the auxiliary heater.

Production of heating and hot water cannot occur at the same time because the exchange valve for heating/hot water is positioned after the auxiliary heater.

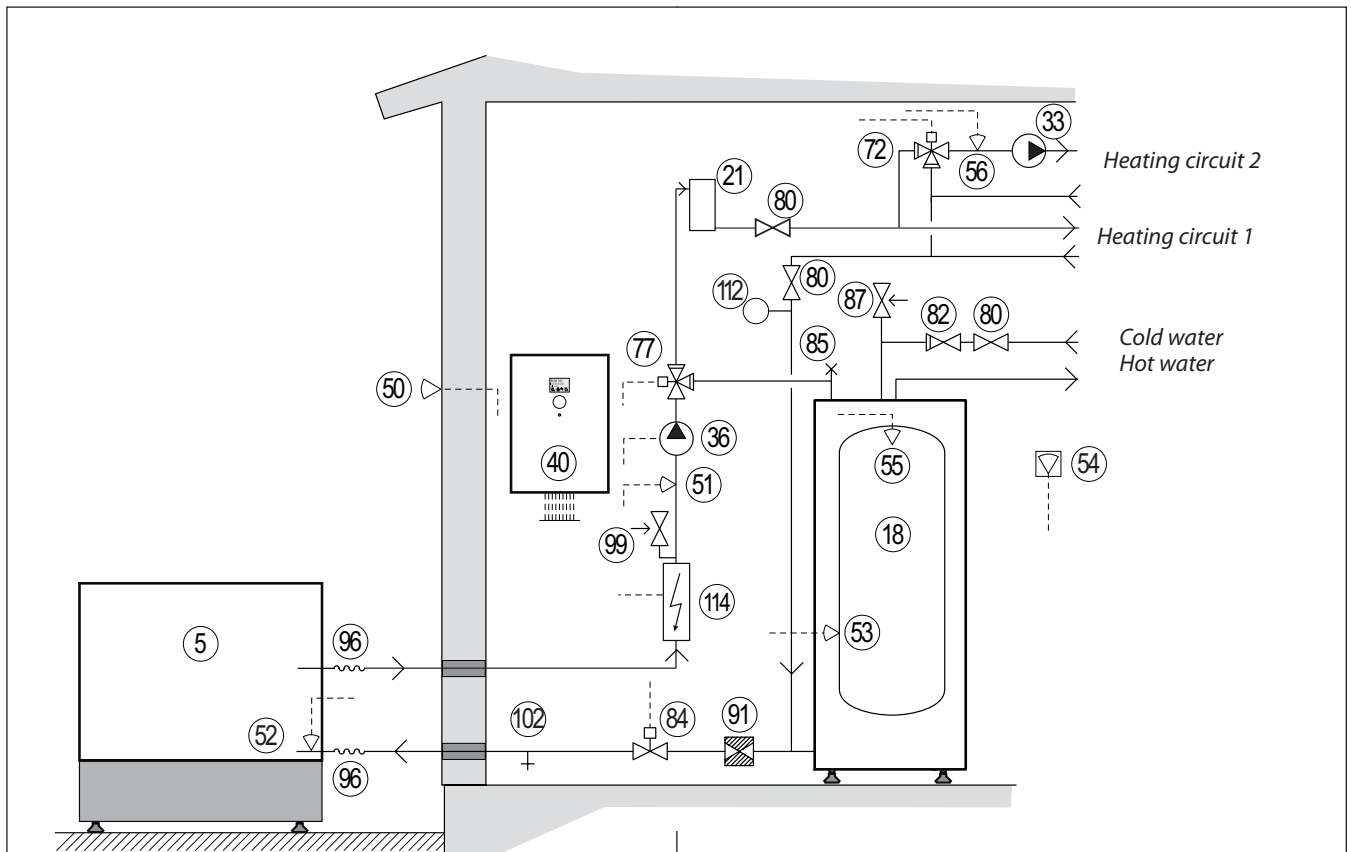
The auxiliary heater carries out peak heating charging (anti-legionella function) in those operating modes that permit auxiliary heat.

Buffer tank

The buffer tank equalises the temperature to the heating system during operation and after defrosting.



The recommendation for the volume is that 10 litres/kW installed heat pump output for heat pumps with heater and 20 litres/kW for heat pumps without heater.



5.1.1 DHP-AX, VL system

Figure 7: General connection diagram.

Position	Name
5	DHP-AX heat pump
18	Water heater (accessory)
21	Buffer tank
33	Circulation pump shunt group (accessory)
36	Circulation pump (option)
40	Control centre
50	Outdoor sensor
51	Supply line sensor
52	Return line sensor
53	Hot water sensor (incl. in DWH, otherwise accessory)
54	Room sensor (option)
55	Peak temperature sensor (incl. in DWH, otherwise accessory)
56	Supply line sensor shunt group (accessory)
72	Shunt valve (accessory)
77	Switching Valve for hot water (accessory)
80	Shut off valve (accessory)
82	Non-return valve (accessory)
84	Flow sensor
85	Bleed valve (accessory)
87	Safety valve (9 bar) (accessory)
91	Strainer
96	Flexible hoses (accessory)
99	Safety valve (1,5 bar)
102	Drain valve (accessory) (only installed if the heat pump is installed lower than the water heater)
112	Expansion vessel, closed (accessory)
114	Auxiliary heater (accessory)

5.2 Connecting cold and hot water lines

1. Connect the cold water and hot water pipes with all the necessary components according to the connection diagram.

5.3 Connecting the heating system supply and return lines



For information on how flexible hoses should be installed, see section 15 Noise information.

1. Connect the supply line with a flexible hose connection and with all the necessary components according to the connection diagram.
2. Connect the return line with a flexible hose connection and with all the necessary components including a strainer according to the connection diagram.
3. Insulate the supply and return lines all the way to the heat pump.

5.4 Filling the water heater and heating system

1. Fill the water heater with cold water by opening the filler valve, which is located on the valve pipe.
2. Bleed by opening one of the hot water taps.
3. Then fill the water heater coil and the heating system with water through the filling valve to a pressure of approx. 1 bar.

5.5 Bleeding the heating system

1. Open all radiator valves fully.
2. Bleed all radiators.
3. Refill the heating system to a pressure of approximately 1 bar.
4. Repeat the procedure until all air has been removed.
5. Leave the radiator valves fully open.

6 Electrical Installation



Electrical current! The terminal blocks are live and can be highly dangerous due to the risk of electric shock. All power supplies must be isolated before electrical installation is started. The heat pump is connected internally at the factory, for this reason electrical installation consists mainly of the connection of the power supply.



Danger! Electrical installation may only be carried out by an authorized electrician and must follow applicable local and national regulations.



The electrical installation must be carried out using permanently routed cables. It must be possible to isolate the power supply using an all-pole circuit breaker with a minimum contact gap of 3 mm.

6.1 Control centre

6.1.1 Installation



The control centre must be installed in a frost free environment.

The control centre contains necessary components for voltage supply, control system and operation.

6.1.2 Electrical components in 400V 3N control centre

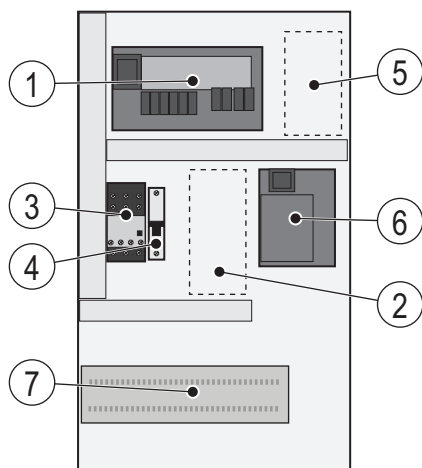


Figure 8: The location of the components in the control centre.

Position	Name
1	I/O card
2	Expansion card (accessory)
3	Overcurrent relay
4	Fuse
5	Defrost card
6	Soft starter
7	Terminal blocks

6.1.3 Electrical components in 230V 1N control centre

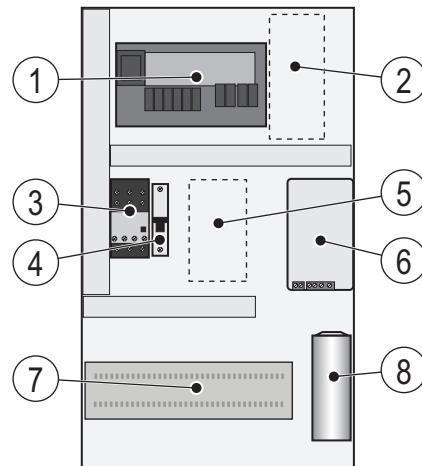


Figure 9: The location of the components in the control centre.

Position	Name
1	I/O card
2	Expansion card (accessory)
3	Overcurrent relay
4	Fuse
5	Defrost card
6	Soft starter
7	Terminal blocks
8	Capacitor

6.2 Cable connection



Electrical connection can also cause noise so this installation must be carried out appropriately. An appropriate installation is where there is approximately 300 mm free cable between the heat pump and the building. It is inappropriate to bolt trunking between the heat pump and the wall. This is because vibrations can then be transmitted from the heat pump through the trunking to the walls of the house.

The heat pump, which is located outdoors is connected to the control centre, which is located indoors. This places demands on which type of cable to use for the different connections. The following list provides information about which type of cable meets the requirements regarding cross section, UV protection etc:

- 400V 6, 8, 10 and 12kW
 - Communication cable
ÖLFLEX CLASSIC 110 12G0.5 0.6/1kV CY BK
 - Power cable
ÖLFLEX CLASSIC 110 12G2.5 0.6/1kV BK
- 230V 6kW
 - Communication cable
ÖLFLEX CLASSIC 110 12G0.5 0.6/1kV CY BK
 - Power cable
ÖLFLEX CLASSIC 110 12G2.5 0.6/1kV BK
- 230V 8, 10 and 12 kW
 - Communication cable
ÖLFLEX CLASSIC 110 12G0.5 0.6/1kV CY BK
 - Power cable except compressor
ÖLFLEX CLASSIC 110 7G2.5 0.6/1kV BK
 - Power cable compressor
ÖLFLEX CLASSIC 110 4G4.0 0.6/1kV BK

Maximum cable length 30 m.

- When the cable is connected to the terminal block a screwdriver is used to open the terminal block, see figure below.

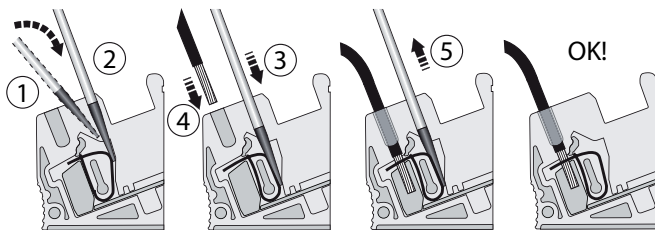


Figure 10: Connecting cable to terminal block.

6.3 Connecting the power supply



Electrical current! The power cable may only be connected to the terminal block intended for this purpose. No other terminal blocks may be used!

6.4 Positioning and connecting outdoor sensors



NOTE! The outdoor sensor is connected with extra low protection voltage. Follow the specific installation instructions for the outdoor sensor!

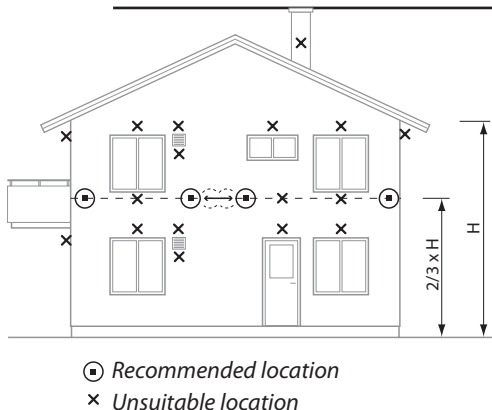


Figure 11: Positioning the outdoor sensor.

- Position the outdoor sensor on the north or north west side of the house.

- To measure the outdoor temperature as accurately as possible, the sensor must be positioned 2/3 of the way up the facade on houses up to three storeys high. For higher buildings, the sensor should be positioned between the second and third storeys. Its location must not be completely protected from the wind but not in a direct draft. The outdoor sensor should not be placed on reflective panel walls.
- The sensor must be positioned at least 1 m from openings in the walls that emit hot air.
- If the sensor cable is connected through a pipe, the pipe must be sealed so that the sensor is not affected by outgoing air.

The outdoor sensor is connected by a two core cable. For a cross section of 0.75 mm² a maximum cable length of 50 m applies. For greater lengths a cross section of 1.5 mm² is used, up to a maximum of 120 m.

Then connect the sensor to the heat pump's control centre according to the electrical instructions.

7 Installing accessories/ additional functions

7.1 Room temperature sensor

The room temperature sensor has a temperature sensor that provides a further value that the control system can use when calculating the supply temperature. The influence of the room sensor in the calculation can be set in the menu HEAT CURVE-> ROOM FACTOR. Default setting for ROOM FACTOR is 2 but can be adjusted from 0 (no impact) to 4 (large impact).

The difference between the desired and actual indoor temperature is multiplied by the set value for ROOM FACTOR. The set point on the heating system's supply line increases or decreases with the result depending on whether there is a deficit or surplus of heat.

The table below shows examples of how the set point for the supply line is affected at CURVE 40 with different settings for ROOM FACTOR.

In the event of a heating deficit:

ROOM FACTOR	Increased room temperature, °C	Actual room temperature, °C	Set point for supply line, °C
0	22	20	40
1	22	20	42
2	22	20	44
3	22	20	46
4	22	20	48

In the event of a surplus of heat the conditions are the opposite:

ROOM FACTOR	Increased room temperature, °C	Actual room temperature, °C	Set point for supply line, °C
0	20	22	40
1	20	22	38
2	20	22	36
3	20	22	34
4	20	22	32



NOTE! The room temperature sensor is connected to a safety extra-low voltage.

1. Install the room temperature sensor in a location in the house where the room temperature is relatively constant:
 - Centrally located in the house
 - At eye level
 - Not in direct sunlight
 - Not in a draft
 - Not in a room with alternative heating
 2. Hang a thermometer next to the room temperature sensor in order to calibrate it after connecting it.
 3. Connect the room sensor according to the electrical instructions.
 4. After connecting the room temperature sensor, it is calibrated by holding in both buttons for 15 seconds until the display starts to flash.
 5. Set the actual room temperature that the thermometer shows.
 6. Wait 10 seconds until the display stops flashing.
- If the display shows "--" for outdoor temperature no outdoor temperature has been read.

7.2 EVU function

The EVU function prevents the operation of HEAT PUMP and AUX. HEATER as long as the contact is closed. The text EVU STOP is shown in the display when this function is active. The integral is calculated as normal.

- The EVU function is activated by connecting according to the electrical instructions as well as by connecting an external 1-pin timer for example.

7.3 Room setpoint reduction

The room setpoint reduction function provides a regular, temporary reduction of the indoor temperature.

- The room setpoint reduction function is activated using the same connection as for the EVU function according to the electrical instructions, and with the aid of a 10 kohm resistor and an external 1-pin timer for example.
- The extent of the room setpoint reduction is set in the menu INFORMATION -> HEAT CURVE -> REDUCTION.

8 Checking the installation

NOTE! Read the safety instructions!



The installation may only be commissioned if the heating system and water heater have been filled and bled. Otherwise the circulation pumps can be damaged.



Any alarms that may occur in connection with the installation can be fault-traced in the 15 Troubleshooting section in the service instructions.

8.1 Starting before the installation is complete

For further information about the heat pump's control system, see section 12 Control panel.

8.2 Installation checklist

Before manual test operation, the following points must be checked so that they are carried out:

8.2.1 Piping installation, heating system

- Pipe connections in accordance with the connection diagram
- Flexible hoses on the supply and return lines
- Pipe insulation
- Strainer on return line
- Bleeding the heating system
- All radiator valves fully open
- Expansion tank heating system (not included in the delivery)
- Safety valve for expansion tank
- Filler cock, heating system (not included in the delivery)
- Leakage inspection
- Safety valve for cold water (9 bar) (not included in the delivery)

If an external water heater is installed, also check:

- Exchange valve (not included in the delivery)
- Bleed valve (not included in the delivery)

8.2.2 Electrical Installation

- Circuit-breaker (not included in the delivery)
- Fuse protection
- Direction of rotation of the compressor
- Positioning of the outdoor sensor
- Control computer settings

If an external water heater is installed, also check:

- Exchange valve (not included in the delivery)

8.3 Manual test

Test operate and at the same time check the function of the tested components.

8.3.1 Activate MANUAL TEST

1. Ensure that the main circuit breaker is on.
2. Select operating mode \odot , in the menu INFORMATION -> OPERAT.-> \odot
3. Open the SERVICE menu by holding < in for five seconds.
4. Set the value for MANUAL TEST to 2.



Select position 2 to navigate away from the MANUAL TEST menu during ongoing test operation.

8.3.2 Test the circulation pump

1. Start the heating system circulation pump by setting the value CIRC. PUMP to 1.
2. Check that the circulation pump is running by:
 - listening
 - putting a hand on the pump
 - listening for air
3. If the pump does not start see section, 9.1 *Starting circulation pumps manually*.
4. If there is air in the heating system, bleed according to section 5.6 *Bleeding the heating system*.
5. Stop the circulation pump by setting the value to 0.

8.3.3 Test exchange valve for hot water (if installed)

1. Activate the 3-way valve by setting the value REV.V. HOT WATER to 1.
2. Check that the arm on the 3-way valve changes position.
3. If the arm does not change position, see section 15 *Troubleshooting* in the service instructions.



Remember that the hot water must be activated in the SERVICE menu, see section 9.2 *Adaptation to the heating system*.

8.3.4 Test the compressor

1. Start the circulation pump by setting the value CIRC. PUMP to 1
2. Start the heat pump compressor by setting the value HEAT PUMP to 1.



NOTE! Risk of burn injury, the pressure pipe on the compressor can get up to 125 degrees in temperature after operating for a while!

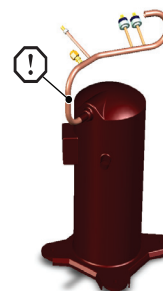


Figure 12: The pressure pipe should get hot during operation.

3. Check that:
 - the compressor is running in the right direction by putting a hand on the pressure pipe before the compressor starts, the pipe is then cold. Feel again after a short while to ensure the pressure pipe becomes properly hot.
 - it sounds normal and there is no noise.
4. If the pipe does not get hot, or if it sounds abnormal, see the 15 *Troubleshooting section in the service instructions*.
5. Stop the compressor by setting the value to 0.
6. Stop the circulation pump by setting the value to 0.

8.3.5 Test auxiliary heater (if installed)

1. Start the circulation pump by setting the value CIRC. PUMP to 1
2. Start the auxiliary heater by setting the value AUX. HEAT 1 to 1.
3. Check that the auxiliary heater works by exiting the menu MANUAL TEST and going into the menu INFORMATION -> TEMPERATURE -> SUPPLY LINE and check that the temperature rises.
4. Return to the menu MANUAL TEST and stop AUX. HEAT 1 by setting the value back to 0.
5. Stop the circulation pump by setting the value to 0.



Remember that the auxiliary heater must be activated in the SERVICE menu, see section 9.2 *Adaptation to the heating system*.

8.3.6 Test the fan

1. Start the fan by setting the value for FAN to 1. Check that the fan runs.

8.3.7 Sensor calibration

To see the locations of the sensors, see section 5.2.1 *DHP-AX, VL system* for the externally located sensors and section 11.2.1 *Heating function* for the internally located sensors.



For further information about the heat pump's control system, see section 12 *Control panel*.

Follow the instructions below to perform a calibration.

1. Detach and remove any insulation by the sensor to be calibrated.
2. Connect a thermometer by the sensor.
3. Note the actual temperature.
4. Open the INFORMATION menu by pressing the left or right button once.
5. Open the TEMPERATURE menu.
6. Note the sensor's measured temperature.
7. Compare the actual and measured temperatures. If there is a difference, the sensor requires calibrating as follows.
8. Open the SERVICE menu by pressing and holding < in for five seconds.
9. Open the INSTALLATION -> SENSOR CALIBRATION menu.
10. Select the relevant sensor.
11. Change the value according to the difference.

8.3.8 Exit test operation

1. Set the value for MANUAL TEST to 0.

8.4 Reinstalling panels

After completed checks and tests the covers must be reinstalled on the heat pump.

9 Start-up and commissioning

9.1 Starting circulation pumps manually

If any of the circulation pumps do not start, it may need to be helped as follows:

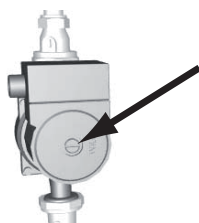


Figure 13: Location of the bleed screw.

1. Open and remove the bleed screw on the front of the pump. Ensure to catch the water that runs out when the screw is removed.
2. Insert a flat blade screwdriver and turn it in the direction of rotation of the pump (clockwise).
3. Reinstall the bleed screw with its rubber seal.

9.2 Adaptation to the heating system

Adjust the heat pump settings to the applicable heating system, for instance an underfloor heating or radiator system. The delta temperature should be 7–10°C above the heat pump. If the delta temperature is not reached, the flow of the circulation pump may need adjusting depending on the applicable heating system.



For further information about the heat pump's control system, see section 12 Control panel.

9.2.1 Hot water



NOTE! If an external water heater is to be installed, it must be activated in the SERVICE menu. See instructions below:

1. Open the SERVICE menu by pressing and holding < in for five seconds.
2. In the HOT WATER-> START menu, set the value to 40.

9.2.2 Aux. heater



NOTE! If an auxiliary heater is to be installed, it must be activated in the SERVICE menu. See instructions below:

1. Open the SERVICE menu by pressing and holding > in for five seconds.
2. In the AUX. HEATER-> MAX STEP menu, set the value to 1.

9.2.3 Noise check

During transportation and installation there is a certain risk that the heat pump can be damaged, components may move or get bent and this can cause noise. Because of this it is important to check the heat pump when it has been installed and is ready to be commissioned to ensure that everything seems in order. The heat pump should be run in both heating and hot water modes to ensure that there is no abnormal noise. While doing this, check that there is no abnormal noise in other parts of the house.

Noise is produced from the heat pump when the fan is in operation, check during manual operation that there is no disturbance in your own home as well as to any neighbours.

9.2.4 Select operating mode



For further information about the heat pump's control system, see section 12 Control panel.

Set the heat pump to the desired operating mode in the menu INFORMATION -> OPERAT. If necessary, set certain parameters in the control system, such as ROOM and CURVE.

9.3 After start up



Remember that it takes time for the heat pump to heat a cold house. It is best to let the heat pump work at its own pace and NOT raise or alter any values in the control system to try to heat it up more rapidly.



NOTE! If there is an alarm in conjunction with installation it usually means that there is air in the system. Also see section 15 Troubleshooting in the service instructions for further information.

10 Customer information

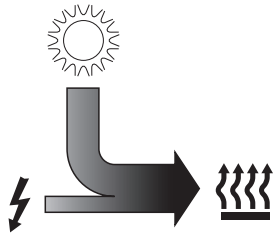
After installation and test operation, the customer must be informed about their new heat pump installation. Below is a checklist regarding the information that the installer must give the customer:

- The model of the heat pump that has been installed
- Run through the User manual and show what it contains
- Describe the various operating modes and what they mean
- Describe the most common alarms and corrective actions
- Demonstrate how to navigate the INFORMATION menu and which settings the customer can set themselves
- Demonstrate how to view history and operating times
- Show the pipe installation and go through the periodic maintenance actions that the customers must be aware of:
 - check recommended pressure on manometers
 - fill the heating system
 - exercise safety valves
 - clean strainer
- Explain how the customer can fine adjust their existing heating system according to the instructions in the User manual
- The applicable warranties
- Where the customer is to turn for servicing
- Finally, fill in the references at the back of the Maintenance instructions.

Service instructions

11 The heat pump

11.1 Function description



A heat pump utilises the free energy from the sun and that is found in a natural heat source, such as rock, ground, ground water or air. The heat pump can be compared to a reversed refrigerator; in a refrigerator heat is transferred from the inside of the refrigerator to the outside, whereas in a heat pump, the stored solar energy that is stored in a heat source is transferred to the inside of the house. The heat pump uses the solar energy in the heat source and gives back two to three times more heat energy than it uses in electrical energy. The heat pump is, therefore, a very environmentally friendly and economical way of heating a house.

Figure 14: The relationship between consumed electrical energy and free solar energy.

In order for the heat pump to be able to retrieve heating energy from the outdoor air and transfer it to the heating system of the house, two separate circuits are required. The figure below shows the different circuits and how they work together in the transfer of heating energy.

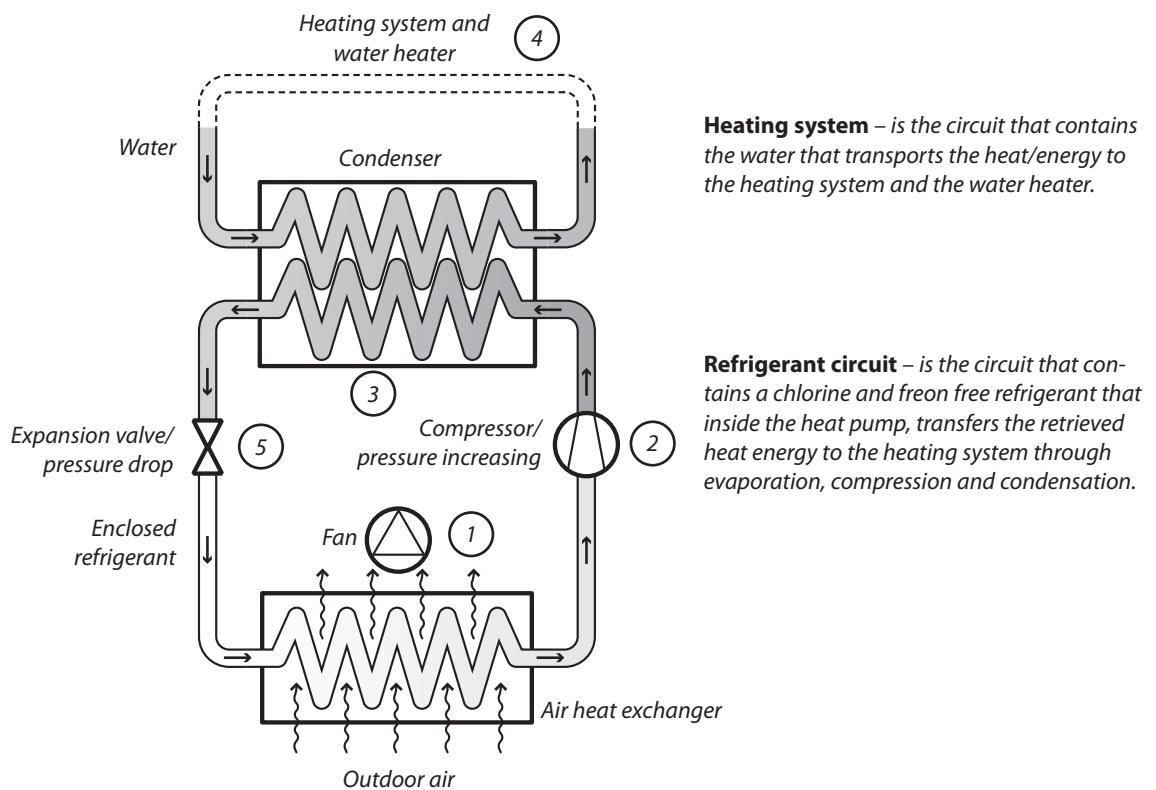


Figure 15: Function principles of a heat pump.

- 1 A fan draws up the outdoor air through an air heat exchanger, which heats up the cold refrigerant, which evaporates into a gas. The energy produced during this process is retrieved from the passing outdoor air.
- 2 The refrigerant that now supplies energy in the form of heat is transferred to the compressor, which both increases its temperature and pressure.
- 3 The extremely hot refrigerant continues to the condenser. Here, the refrigerant is cooled and releases its heating energy to the heating system. The refrigerant's temperature drops and condenses to a liquid state.
- 4 The heating system transports the heating energy out to the water heater or the heating system, which indirectly heats the house.
- 5 The refrigerant is then transported through the expansion valve where the pressure and temperature drop and the process starts again.

11.2 Heating and defrost functions

11.2.1 Heating

DHP-AX is a heat pump that can produce heating for houses and water heaters. Hot water production is active all year round but during the summer heat production to the house is stopped when the outdoor temperature reaches the value for HEAT STOP.

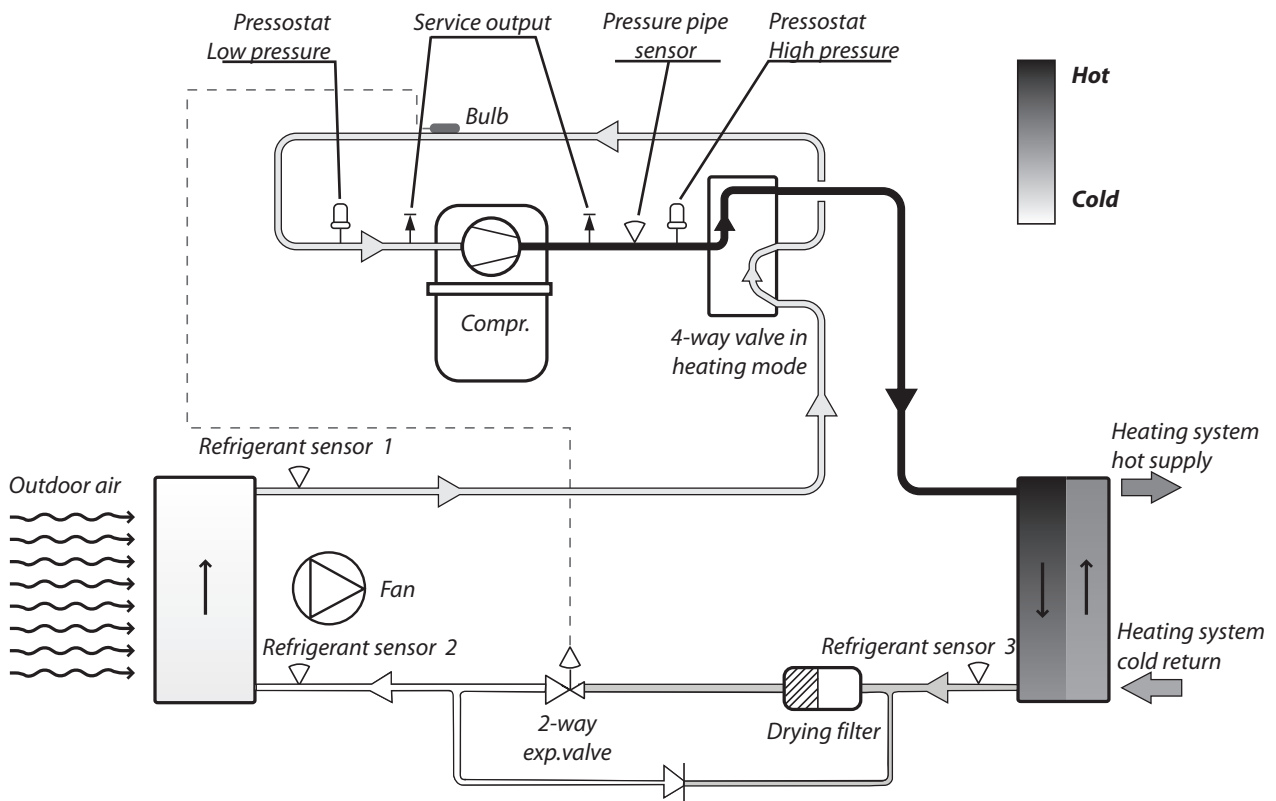


Figure 16: The refrigerant circuit's function during heat production.

During the winter, hot water and heat is produced for the house by the compressor until the outdoor temperature reaches the value for OUTDOOR STOP when it becomes too cold for the compressor to operate. If an auxiliary heater has been installed, it is used to produce hot water and heating for as long as OUTDOOR STOP applies.

DHP-AX defrosts the air heat exchanger automatically if required.

11.2.2 Defrost function

During operation the air heat exchanger is cooled by the energy exchange at the same time as the humidity causes it to become covered in frost. DHP-AX has an automatic function to defrost the air heat exchanger using the produced heat energy. If necessary, a defrosting sequence starts which means the following:

- The defrost sequence starts when the temperature of the incoming refrigerant is lower than the set value, which is based on a curve that is related to the outdoor temperature
- There are restrictions for the defrost regarding time in operation and FAN on
- The four way valve in the heat pump switches the direction of flow of the refrigerant and the fan stops, see figure below
- The hot refrigerant melts the frost on the air heat exchanger
- Defrost stops on time, operating pressostat or incoming temperature
- The four way valve switches the direction of flow of the refrigerant back so that heat production resumes and operation returns to normal

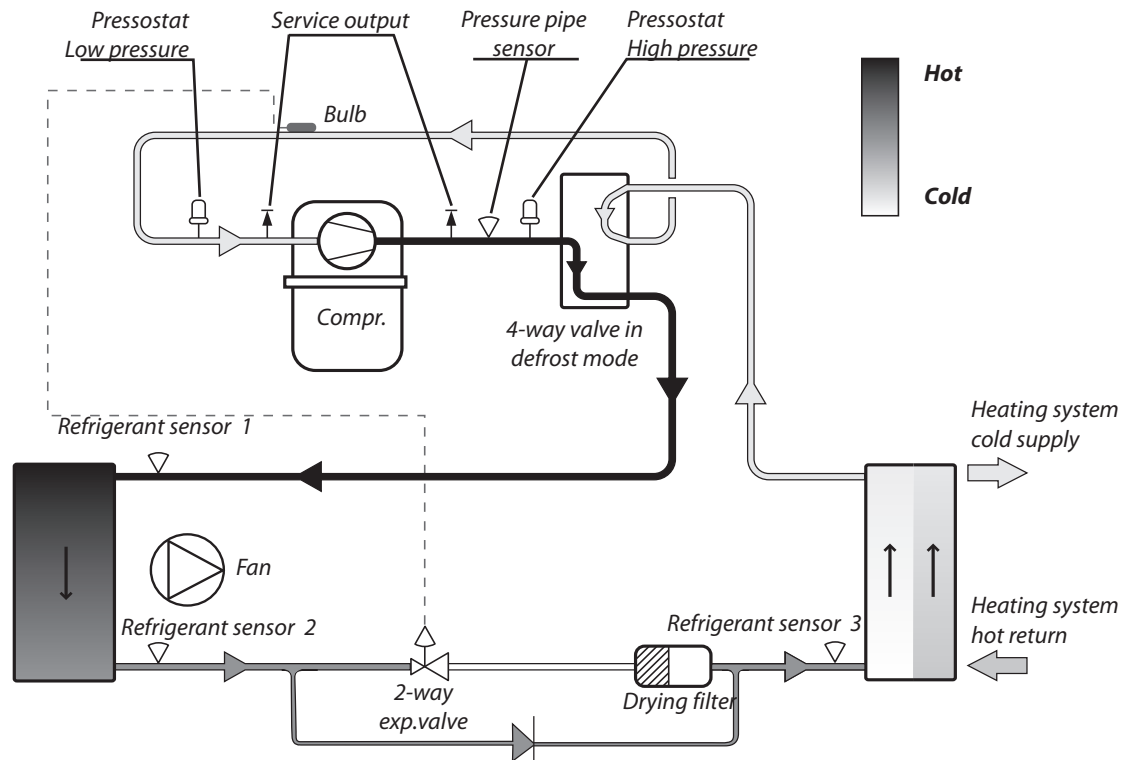


Figure 17: The refrigerant circuit's function during defrost.

The figure above shows DHP-AX during defrost. The process is reversed by means of the four way valve that changes the direction of flow, which means that the air heat exchanger for heating becomes a condenser and the heating's condenser becomes an evaporator. This function is used for defrosting.

As the heat pump's defrosting sequence retrieves its energy from the house's heated heating system during the winter months, the water tank is primarily used as a heating buffer. If a water heater is not installed, the water volume in the heating system must be increased, if the volume does not meet the demand, by installing a surge tank (accessory).

11.3 Components

The heat pump is a complete heat pump installation for heating and hot water.

The heat pump is equipped with control equipment, which is controlled via a control panel.

Heat enters the house via a water borne heating system. The heat pump supplies as much of the heat demand as possible before auxiliary heating is engaged and assists.

The heat pump unit consists of the following basic units:

1 Heat pump unit

- Compressor
- 2-way expansion valve
- Condenser, stainless steel heat exchanger
- 4-way valve

2 Fan

- One speed

3 Air heat exchanger Exchanger with copper pipes and hydrophilic aluminium fins.

In addition to these units, there is control equipment (installed indoors), which controls the heat pump unit's component parts (compressor, circulation pumps, auxiliary heaters and exchange valve) and determines when to start and stop the pump as well as whether to produce heat for the house or hot water.

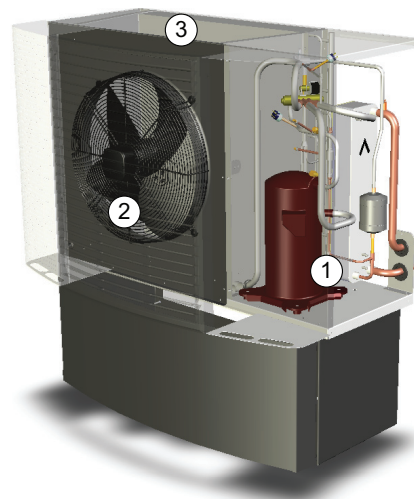


Figure 18: DHP-AX's main components.

11.4 Auxiliary heat

Auxiliary heater is an option for DHP-AX and consists of an immersion heater, which is located on the supply pipe ahead of the exchange valve.

The auxiliary heater, which is supplied as an accessory has an integrated power control and is controlled by a potential free output from the heat pump. In the event of power cuts longer than three minutes, only a 6 kW output may be connected immediately after power has returned, the remaining output is delayed two hours. If the auxiliary heater is installed it engages AUTO mode automatically when the heat demand is greater than the heat pump's capacity.

In the event of alarms that mean that the compressor does not start, hot water will not be produced in order to indicate to the customer that something is wrong. Heat is produced by the auxiliary heater so that the house does not become cold.

11.5 Important parameters

11.5.1 Heat production - calculating

The indoor temperature is adjusted by changing the heat pump's heat curve, which is the control system's tool for calculating what the supply temperature should be for water that is sent out in the heating system. The heat curve calculates the supply temperature depending on the outdoor temperature. The lower the outdoor temperature, the higher the supply temperature. In other words, the supply temperature of the water fed to the heating system will increase exponentially as the outside air temperature falls.

The heat curve will be adjusted in connection with installation. It must be adapted later on, however, to obtain a pleasant indoor temperature in any weather conditions. A correctly set heat curve reduces maintenance and saves energy.

11.5.2 CURVE

The control computer shows the value for CURVE by means of a graph in the character window. You can set the heat curve by adjusting the CURVE value. The CURVE value indicates the supply temperature of the water to be sent out to the heating system at an outdoor temperature of 0°C.

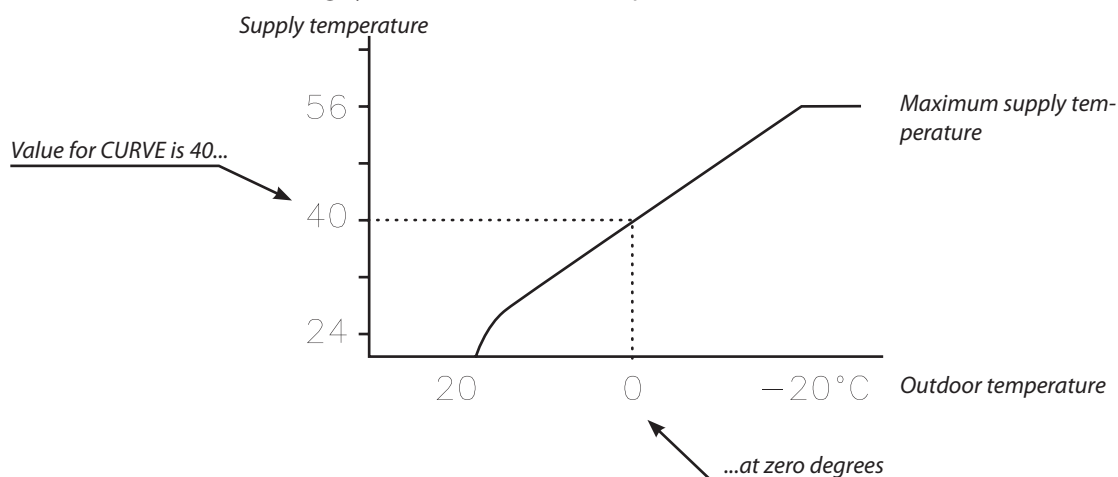


Figure 19: Graph showing the set value 40 for CURVE.

At outdoor temperatures colder than 0°C, supply water hotter than 40°C is sent out to the heating system and at outdoor temperatures greater than 0°C, supply water cooler than 40°C is sent out.

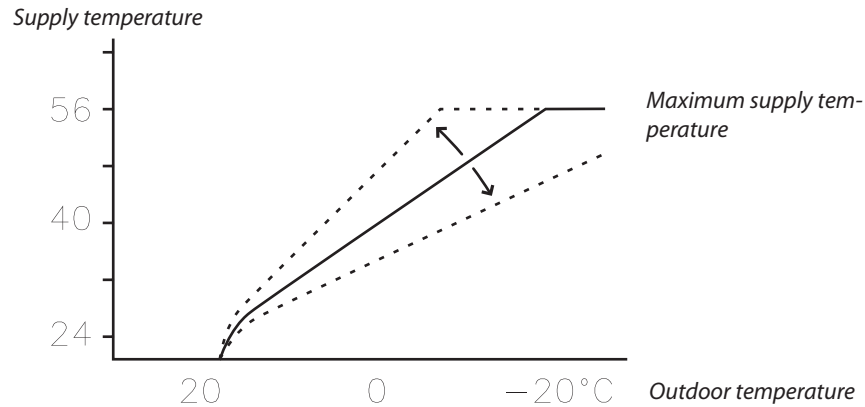


Figure 20: Increasing or reducing the CURVE changes the slope of the curve

If you increase the CURVE value, the heat curve will become steeper and when you reduce it, it will become flatter.

The most energy efficient and cost effective setting is achieved by changing the CURVE value to adjust the temperature in the house to an even and constant temperature. For a temporary increase or reduction, adjust the ROOM value instead.

11.5.3 ROOM

If you wish to increase or reduce the indoor temperature, change the ROOM value. The difference between changing the ROOM value and the CURVE value is that the system's heat curve does not become steeper or flatter if the ROOM value is changed, which the curve becomes if the CURVE value changes, instead the entire heat curve is moved by 3°C for every degree change of the ROOM value. The reason that the curve is adjusted 3°C is that an approximate 3°C increase in supply temperature is usually needed to increase the indoor temperature 1°C.

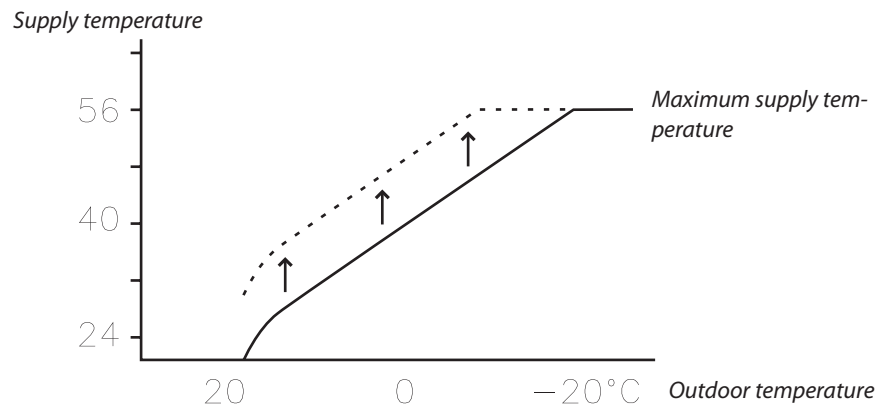


Figure 21: Changing the ROOM value changes the heat curve upwards or downwards.

The relationship of the supply temperature to outdoor temperature will not be affected. The supply temperature will be increased or reduced by the same number of degrees all along the heat curve. I.E. the entire heat curve rises or drops instead of the curve gradient changing.

This method of adjusting the indoor temperatures can be used for a temporary raise or drop. For long term increases or reductions of the indoor temperature, the heat curve is adjusted instead.

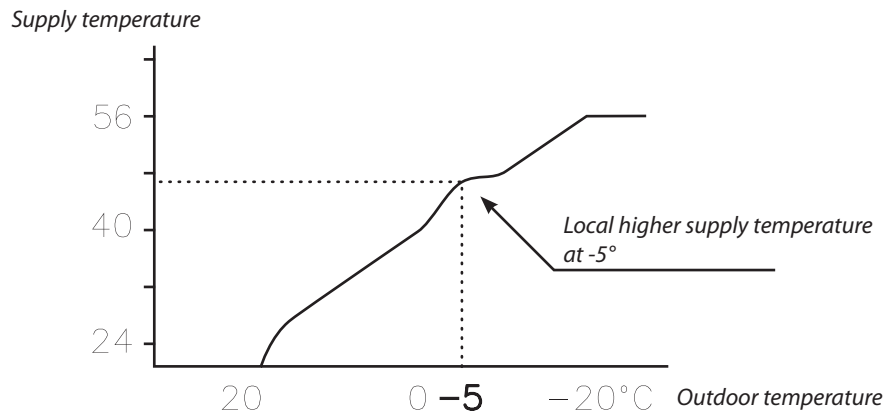


Figure 22: The adjusted curve at -5°C

Sometimes, at outdoor temperatures between -5°C and +5°C, part of the heat curve may need adjusting if the indoor temperature is not constant. For this reason, the control system includes a function adjusting the curve at three outdoor temperatures: -5°C, 0°C, +5°C. This function will allow you to increase or reduce the setpoint value for the supply line temperature, without affecting the rest of the heat curve, at three specific outdoor temperatures. If, for example, the outdoor temperature is -5°C, the supply temperature will change gradually between 0°C and -10°C, maximum adjustment being reached at -5°C. The figure above shows the adjusted CURVE -5. The adjustment can be seen in the graph in the form of a bump.

You can choose to adjust the heat curve individually at three specified outdoor temperatures: -5°C, 0°C and +5°C. The supply temperature can be changed by plus/minus 5 degrees.

11.5.4 HEAT STOP

The HEAT STOP function automatically stops all production of radiator heat when the outdoor temperature is equal to, or higher than, the value entered for heat stop.

When the heat stop function is activated, the circulation pump will be turned off - except when hot water is being produced. The circulation pump will be "exercised" for 1 minute per day. The factory set value for activating heat stop is an outdoor temperature of 17°C. If the heat stop function is active, the outdoor temperature must drop 3°C when setting, before the heat stop stops.

11.5.5 MIN and MAX

The MIN and MAX values are the lowest, respectively highest **set point values** that are allowed for the supply temperature.

Adjusting the minimum and maximum **set point value** for the temperatures is particularly important if your home has under floor heating.

If your house has under floor heating and parquet floors, the supply temperature must not be too high. Otherwise there is a risk that the parquet floors might be damaged. If you have under floor heating and stone floors, MIN should not be too low in order to achieve a comfortable floor temperature in the summer time when heating is not required. A possible solution to obtain optimum temperatures is to use a shunt group for under floor heating.

If your house has a basement, the MIN value should be adjusted to a suitable temperature for the basement in summer. A condition for maintaining the heat in the basement in the summer is that all radiators have thermostat valves that switch off the heat in the rest of the house. It is extremely important that the heating system and the radiator valves are trimmed correctly. As it is usually the end customers themselves who have to carry out trimming, remember to inform them how to carry it out correctly. Also remember that the value for HEAT STOP needs adjusting upwards for summer heating.

11.5.6 TEMPERATURES

The heat pump can display a graph showing the history of the various sensors' temperatures and you can see how they have changed over 60 measurement points in time. The time interval between the measurement points can be adjusted between one minute and one hour, factory setting is one minute.

History is available for all sensors, but only the set value is shown in the display for the room sensor. The integral value that may appear is the heating system's energy balance.

11.5.7 INTEGRAL

The heat demand in the house depends on the season and weather conditions and is not constant. The heat demand can be expressed as temperature difference over time and can be calculated giving an integral value as a result (heat demand). To calculate the integral value, the control system uses several parameters.

A heat deficit is needed to start the heat pump, and there are two integral values, A1 (default value = -60), which starts the compressor and A2, (default value = -600), which starts the auxiliary heater. During heat production, the deficit reduces and when the heat pump stops, the inertia in the system causes a surplus of heat.

The integral value is a measurement of the surface under the time axle and is expressed in degree minutes. The figure below shows the factory settings for the integral values that the heat pump has. When the integral value has reached the set value for INTEGRAL A1, the compressor starts and if the integral value does not drop but continues to rise, the auxiliary heater starts when the integral value has reached the set value for INTEGRAL A1+A2.

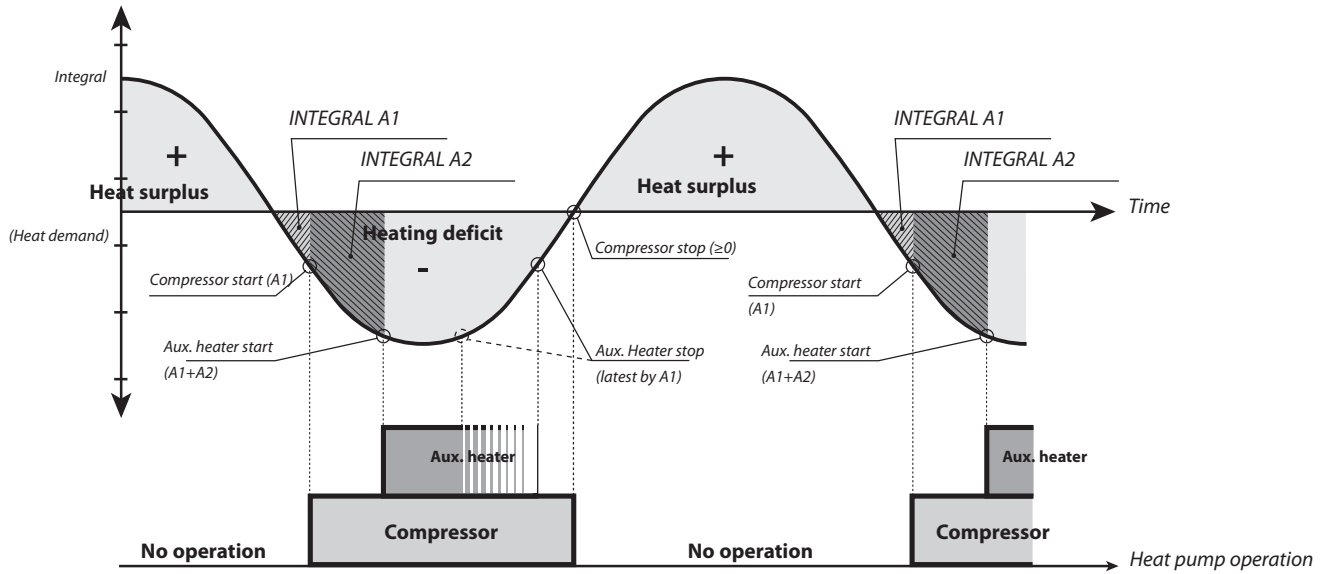


Figure 23: Starting and stopping heat pump operation based on integral values.

The calculation of the integral value stops during heat stop. Integral value calculation resumes two minutes after completed hot water production to give the heating system time to stabilise the temperature.

11.5.8 HYSTERESIS

In order to start the heat in advance during sudden changes of the heat demand, there is a value, HYSTERESIS, which controls the difference between the actual supply temperature, t_1 and the calculated supply temperature, t_2 . If the difference is the same or greater than the set HYSTERESIS value (x), i.e. there is a heat demand, or the heat demand disappears, quicker than the usual integral calculation, the integral value is forced to either the start value INTEGRAL A1 or to the stop value 0°min .

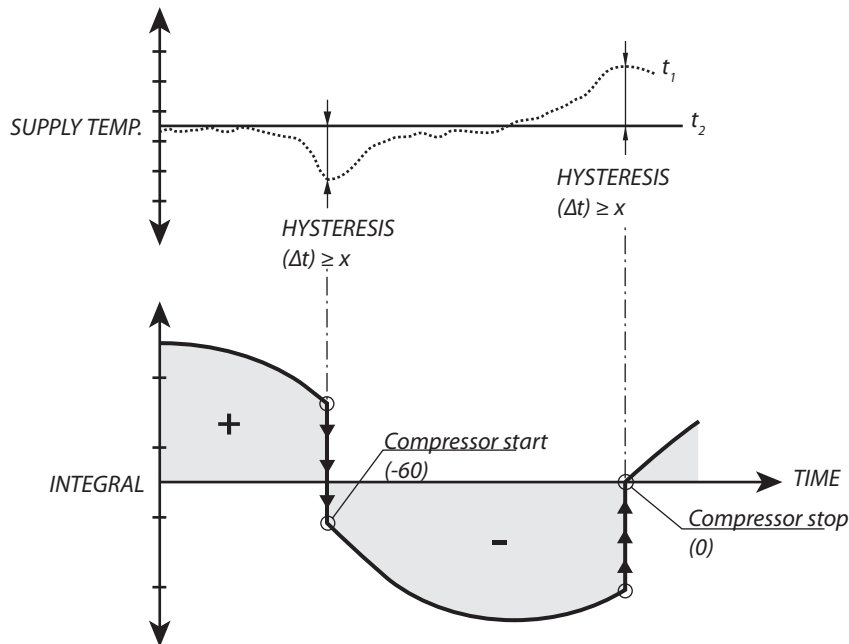


Figure 24: Conditions for HYSTERESIS to force the integral value to change.

11.5.9 DEFR CURVE

To start defrosting the outdoor unit, the control system makes a calculation using the temperature of the incoming refrigerant and the outdoor temperature.

What guides the calculation is a linear defrosting curve that can be set so that the heat pump and outdoor unit work optimally. The setting of three different values can be changed: DEFR CURVE 0, DEFR CURVE -20 and OUTDOOR STOP. The defrosting sequence starts when the temperature of the incoming refrigerant reaches the set parameter value at an outdoor temperature somewhere along the set defrosting curve.

The two parameters that are mainly changed are DEFR CURVE 0 and DEFR CURVE -16. The numbers behind the DEFR CURVE display what outdoor temperature the setting is for, that is to say at 0°C for DEFR CURVE 0 and -16 for DEFR CURVE -16. The value -16 for DEFR CURVE -16 is the set value for OUTDOOR STOP, so if the value for OUTDOOR STOP changes, the numbers behind DEFR CURVE also change.

Factory setting for OUTDOOR STOP is -16°C. At this outdoor temperature, compressor operation is stopped and the addition takes over. It is seldom that the value of OUTDOOR STOP needs to be changed, tests and operating cases have shown that -16°C operates very well as the stop temperature. In the text and figures below the value -16°C has been used for OUTDOOR STOP.

The display shows the value for DEFR CURVE 0 and DEFR CURVE -16 by means of a graph in the character window.

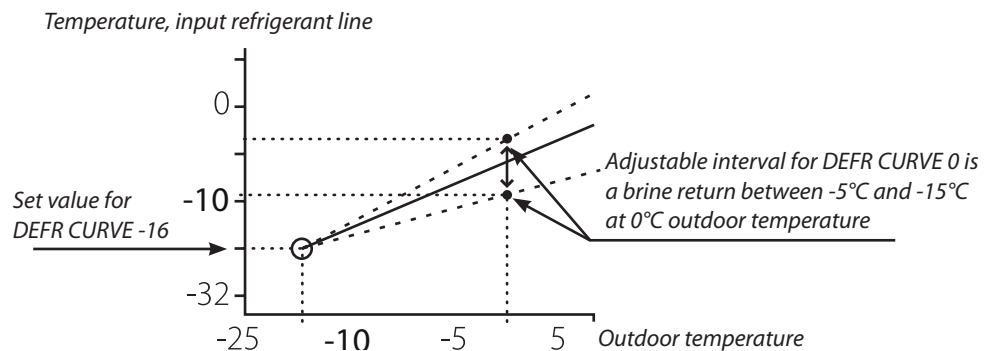


Figure 25: Graph that shows how the value for DEFR CURVE 0 can be set.

The value for OUTDOOR STOP that is set means that the compressor will no longer be used for heating or hot water production if the outdoor temperature is the same as or lower than the value. Heating and hot water production then occurs with the help of the auxiliary heater.

The value for DEFR CURVE 0 is the temperature that the incoming refrigerant is permitted to reach when a defrost must start at an outdoor temperature of 0°C.

In the corresponding way the value for DEFR CURVE -16 is the temperature that the incoming refrigerant has when a defrost should start at the set outdoor temperature for OUTDOOR STOP. The setting for DEFR CURVE -20 means that the value OUTDOOR STOP (-16°C) is reduced by between 1 and 5 degrees. This also determines how much lower the temperature for the incoming refrigerant may be than -16°C in this case.

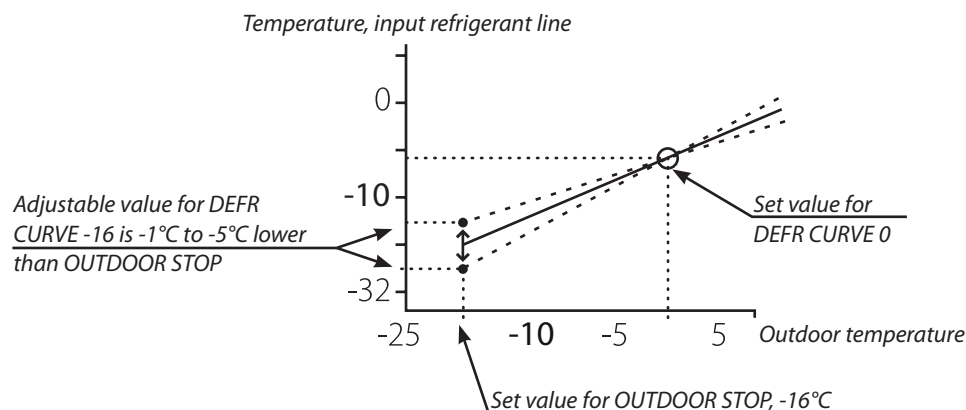


Figure 26: Graph that shows how the value for DEFR CURVE -16 can be set.

These three settings together create the defrosting curve and all three values have an effect on when defrosting will start, even if it is mainly DEFR CURVE 0 and DEFR CURVE -16 that is changed.

12 Control panel

12.1 Function description

The heat pump has an integrated control system that is used to automatically calculate the heat demand in the house where the heat pump is installed and to ensure that the correct amount of heat is produced and emitted where necessary. There are many different values (parameters) that must be referred to during the calculation of the heat demand.

During installation and service, the control panel is used to set and change values that have to be adapted according to the house demand. The control panel is integrated into the front of the heat pump and consists of a display, a keypad and an indicator. In the display, a simple menu system is used to navigate the desired settings and values. During operation, the display always shows the set ROOM value, the operating mode and the status of the heat pump.

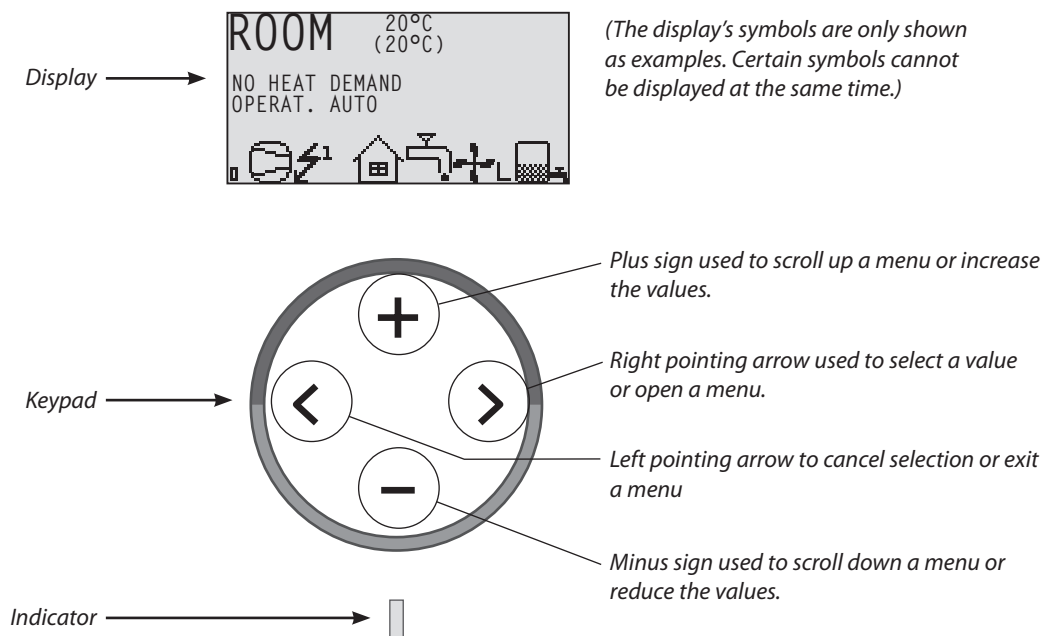


Figure 27: Display, keypad and indicator.

The control system is controlled using a user-friendly menu system, which is shown in the display. Use the keypad's four navigation symbols to navigate the menus and increase or reduce the set values:

The menu, INFORMATION, is opened by pressing the left or right buttons. The INFORMATION menu has a number of sub menus that are described in section 13 Menu information.

For installation and service, the hidden menu, SERVICE, is used. This is opened by holding the left button depressed for five seconds. The SERVICE menu has a number of sub menus that are described in section 13 Menu information.

The INFORMATION and SERVICE menus are intended for two categories of user, end customers and installers. End customers may only open the INFORMATION menu with a limited number of settings whilst installers have to change many settings in the control settings. The SERVICE menu is therefore hidden from end customers.

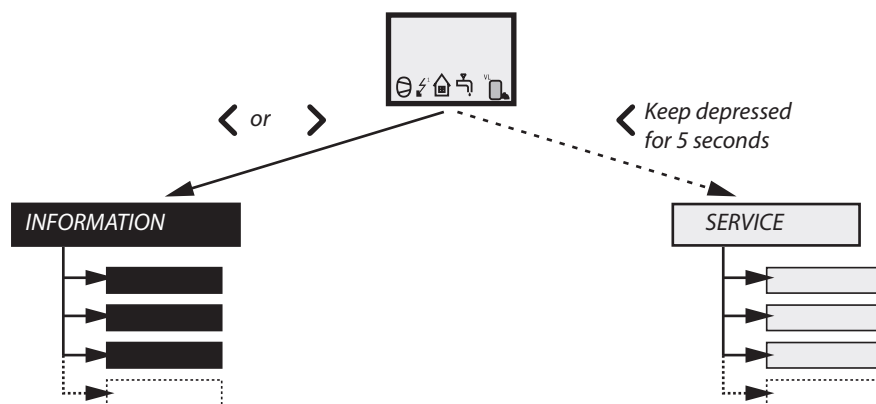


Figure 28: The menus are reached via different button presses.

The indicator at the bottom of the control panel has two modes:

- Lit continuously, the heat pump has power and is ready to produce heat or hot water
- Flashing, means an active alarm



NOTE! During a service that consists of replacing the display card, all heat pump settings are lost. If possible, note all specific settings for the customer's heat pump before replacement.

12.2 Display

The display shows information about the heat pump's operation, status and any alarms, in text form. Operating mode and status, indicated by symbols, are also shown in the lower section which shows the heat pump's active processes.



12.2.1 Changing the display language



To change the display language, press the following sequence of buttons: < (5 seconds), >, -, -, -, >, >. Now you can select language, make your selection using - or +.








12.2.2 Operating modes



Shows the set operating mode of the heat pump.

Operating mode	Meaning
 (OFF)	The installation is fully switched off. This mode is also used to acknowledge certain alarms.  Remember that if the operating mode OFF is to be used for long periods during the winter, the water in the heating system in the installation must be drained, otherwise there is a risk of frost damage.
AUTO	The heat pump and the auxiliary heater are automatically controlled by the control system.
HEAT PUMP	The control system is controlled so that only the heat pump unit (compressor) is allowed to operate. In this operating mode peak heating charging (anti-legionella function) of the hot water will not be run because auxiliary heaters must not be used.
AUX. HEATER	The control system only permits the auxiliary heater to be in operation. This operating mode can be used when a new installation is being used, when the brine system is not ready for operation.
HOT WATER	In this mode the heat pump only produces hot water, no heat goes to the heating system.

12.2.3 Symbols

The following symbols can appear in the display.

Symbol	Meaning
 HP	Indicates that the compressor is in operation.
 LIGHTNING	Indicates that the auxiliary heater is in operation.
 HOUSE	Indicates that the heat pump intends to produce heat to the heating system.
 TAP	Indicates that the heat pump intends to produce heat to the water heater.
F FLOW SENSOR	An "F" next to the symbol indicates that a flow sensor is installed.
 CLOCK	Indicates that tariff control is active.
 TANK	Indicates the level of hot water in the water heater. During charging, the tank is filled and filling starts at the set start temperature. A lightning symbol by the symbol indicates peak heating charging (anti-legionella function).
 SQUARE	Either indicates that the operating pressure switch has deployed, or that the pressure pipe temperature has reached its maximum temperature.

Symbol		Meaning
	DEFROST	Displayed when defrosting is active.
	FAN	Displayed when the fan is active.

12.2.4 Operational information

Shows text information about the heat pump.

Message	Meaning
ROOM	Shows the set ROOM value. Standard value: 20°C. If the accessory room sensor is installed it shows the actual temperature and the indoor temperature within brackets.
START	Indicates that there is a need for heat production and that the heat pump will start.
EVU STOP	Indicates that the additional function EVU is active. This means that the heat pump is off as long as EVU is active.
NO HEAT DEMAND	Indicates that there is no heating production demand.
HEAT PUMP START --XX	Indicates that there is a heating production demand and will start in the specified number of minutes.
HEAT PUMP+AUX. HEAT	Indicates that heat production is active with both compressor and auxiliary heater.
AUX. HEATER	Indicates that there is an auxiliary heater demand.
DEFROST X(Y)	Displayed when defrosting is active. X refers to temperature and Y is the temperature that is to be reached when it stops defrosting.

13 Menu information



13.1 INFORMATION menu

This menu is used to change the heat pump's operating modes and adjust the heat curve. History and operating times can also be viewed here. Open the menu by pressing the left or right button. The sub menus always available in the INFORMATION menu are shown in the following table in bold: Menus in italics are only visible if the expansion card and certain sensors are installed.

Menu	Sub menu	Selection/settings
INFORMATION	OPERAT.	
		Ø AUTO HEAT PUMP AUX. HEATER HOT WATER <i>MANUAL TEST</i>
	HEAT CURVE	
		CURVE MIN MAX CURVE +5 CURVE 0 CURVE -5 HEAT STOP REDUCTION ROOM FACTOR <i>POOL</i> <i>POOL HYSTERESIS</i>
	HEAT CURVE 2 (Expansion card)	
		<i>CURVE 2</i> <i>MIN</i> <i>MAX</i>
	TEMPERATURE	
		OUTDOOR ROOM SUPPLY LINE RETURN LINE HOT WATER INTEGRAL REFR 1 REFR 2 <i>POOL</i> <i>SHUNT GROUP</i> <i>CURRENT</i>
	OPERAT. TIME	
		HEAT PUMP AUX. HEAT 1 HOT WATER
	DEFROST	
		DEFROSTS BETW. 2 DEFR TIME LAST DEFR DEFROST CURVE MANUAL DEFROST


13.1.1 Sub menu INFORMATION -> OPERATION

Used to select operating mode.

Menu selection	Meaning	Factory setting
 (OFF)	The installation is off. This mode is also used to acknowledge certain alarms. CANCEL = starting point, no changes made. To select OFF as operating mode, press the minus sign once to scroll down one step and press the right arrow once.	-
AUTO	Automatic operation with both heat pump and auxiliary heater permitted. If the number of power stages for auxiliary heating are set to zero (SERVICE -> AUX.HEAT -> MAX STEP) only AUTO or OFF can be selected as operating mode.	-
HEAT PUMP	Operation with only heat pump permitted.  NOTE! No peak heating charging (anti-legionella function) with only heat pump operation.	-
AUX. HEATER	Operation with only auxiliary heater permitted.	-
HOT WATER	Operation with heat pump for hot water production and auxiliary heater during peak heating charging (anti-legionella function).	-
<i>MANUAL TEST</i>	Only displayed when the value for MANUAL TEST is set to 2 in the SERVICE menu. Outputs controlled manually.	-

13.1.2 Sub menu INFORMATION -> HEAT CURVE

Used to change settings for the heat curve.

Menu selection	Meaning	Factory setting
CURVE	Calculated supply temperature at 0°C outdoor temperature. Shown as a graph that also shows MIN and MAX values.	40°C (during under floor heating 30°C) (interval: 22°C / 56°C)
MIN	Minimum permitted supply temperature, if the temperature for heat stop has been reached and the heat pump has stopped.	10°C (interval: 10°C / 50°C)
MAX	Maximum permitted supply temperature.	55°C (during under floor heating 45°C) (interval: 40°C / 85°C)
CURVE 5	Local increase or reduction of CURVE at an outdoor temperature of +5°C. Shown in the graph for CURVE.	0°C (interval: -5°C / 5°C)
CURVE 0	Local increase or reduction of CURVE at an outdoor temperature of 0°C. Shown in the graph for CURVE.	0°C (interval: -5°C / 5°C)
CURVE -5	Local increase or reduction of CURVE at an outdoor temperature of -5°C. Shown in the graph for CURVE.	0°C (interval: -5°C / 5°C)
HEAT STOP	Maximum outdoor temperature when heat production is permitted. If HEAT STOP applies, the outdoor temperature must drop 3°C below the setting before HEAT STOP stops.	17°C (interval:  , 0°C / 40°C)
REDUCTION	Only appears if the tariff control function has been activated. Lowering set room temperature. Active at 10 kohm connection at EVU input.	2°C (interval: 1°C / 10°C)
ROOM FACTOR	Only displayed if an accessory Room temperature sensor is installed. Determines how large an impact the room temperature is to have when calculating the supply temperature. For underfloor heating we recommend a setting between 1-3 and for radiator heating between 2-4.	2 (interval: 0 / 4) (0 = no impact, 4 = large impact)

Menu selection	Meaning	Factory setting
<i>POOL</i> (Expansion card)	Only appears if POOL is selected. The temperature in the pool is controlled by a separate sensor regardless of the heating and hot water system.	20°C (interval: ☺, 5°C / 40°C)
<i>POOL HYSTERESIS</i> (Expansion card)	Only appears if POOL is selected. In simple terms, the POOL HYSTERESIS is the temperature interval between start and stop for pool heating. If the difference between the actual supply temperature to pool and the calculated supply temperature is too great, either the integral value is set to start value A1 (the heat pump starts) or the value is set to 0 (stops the heat pump).	2°C (interval: 1°C / 10°C)

13.1.3 Sub menu INFORMATION -> HEAT CURVE 2

Only appears if shunt group sensor (T2) is connected and activated in menu SERVICE -> INSTALLATION -> SYSTEM -> SHUNT GROUP. Used to change settings for heat curve 2.

Menu selection	Meaning	Factory setting
<i>CURVE 2</i>	Calculated shunt group temperature at 0°C outdoor temperature. Shown as a graph that also shows MIN and MAX values.	40°C (interval: 22°C / 56°C)
<i>MIN</i>	Minimum permitted shunt group temperature, if the temperature for heat stop has not been reached.	10°C (interval: 10°C / 50°C)
<i>MAX</i>	Maximum permitted shunt group temperature.	55°C (interval: 15°C / 70°C)

13.1.4 Sub menu INFORMATION -> TEMPERATURE

Used to indicate the prevailing temperatures, history and set/calculated values. History can be accessed to view all the values by pressing the right arrow to present a graph of the last 60 measurement points for the set time interval (SERVICE -> INSTALLATION -> LOGTIME). In the event of an alarm, history stops being logged until the alarm is reset by changing the operating mode to OFF.

Menu selection	Meaning	Factory setting
OUTD	Shows the actual outdoor temperature.	-
ROOM	Shows the actual set temperature.	-
SUPPLY LINE	Shows the actual supply temperature. The calculated supply temperature to the heating system group is within brackets. During hot water production in operating mode AUX. HEATER the value for HOT WATER STOPP + 5° is shown within brackets.	-
RETURN LINE	Shows the actual return temperature. The stop temperature, MAX RETURN is within brackets.	-
HOT WATER	Shows the actual hot water temperature.	-
INTEGRAL	Shows the actual calculated value for integral.	-
REFR 1	Shows the actual temperature of the refrigerant.	-
REFR 2	Shows the actual temperature of the refrigerant.	-
<i>POOL</i> (Expansion card)	Only appears if POOL is selected. Shows the actual pool temperature. The set pool temperature is shown in brackets.	-
SHUNT GROUP	Only appears if SHUNT GROUP is selected. Shows the actual supply temperature. The calculated supply temperature to the shunt group is within brackets.	-
<i>CURRENT</i> (Expansion card)	Only appears if CURRENT LIMITER is selected. Shows the actual current consumption. The set value for MAX CURRENT is shown between brackets.	-

13.1.5 Sub menu INFORMATION -> OPERAT. TIME

Used to show the operating time for each component. Time given in hours.

Menu selection	Meaning	Factory setting
HEAT PUMP	Compressor operating time for both heating and hot water production.	-
AUX. HEAT 1	Operating time auxiliary heat step 1.	-
HOT WATER	Operating time hot water with compressor.	-

13.1.6 Sub menu INFORMATION -> DEFROST

This menu is used to obtain information about outdoor unit defrosting and to make certain settings.

Menu selection	Meaning	Factory setting
DEFROSTS	Total number of defrosts carried out.	-
BETW. 2 DEFR	The operating time of the compressor in minutes between the 2 last defrosts.	-
TIME LAST DEFR	The operating time of the compressor in minutes since last defrost.	-
DEFROST CURVE	Here, the angle of the defrost curve can be changed using + or - (Change the start temperature for defrost).	-7°C (interval: -10°C / -4°C)
MANUAL DEFR	Use + or - to start a manual defrost.	0 (interval: 0 / 1)

13.2 SERVICE menu

This menu is for use during installation and service to optimise and adjust the operation of the heat pump. Open the menu by holding the left button in for five seconds. The sub menus always available in the SERVICE menu are shown in the following table in bold: Menus in *italics* are only visible if the expansion card is installed.

Menu	Sub menu	Selection/settings	
SERVICE			
	HOT WATER		
		START HOT WATER TIME HEATING TIME TOPH. INTERVAL TOPH. STOP INFL. H.W SENSOR. WEIGHT HOT WATER	
	HEAT PUMP		
		INTEGRAL A1 HYSTERESIS MAX RETURN START INTERVAL PRESS. PIPE OUTDOOR STOP SHUNT TIME	
	AUX. HEATER		
		MAX STEP INTEGRAL A2 HYSTERESIS MAX STEP <i>MAX CURRENT</i> HOT WATER STOP	
	MANUAL TEST		
		MANUAL TEST HEAT PUMP COMPR. HE CIRC.PUMP REV.V. HOT WATER AUX. HEATER 1 FAN <i>ALARM</i> SHUNT GROUP <i>REV. V. POOL</i>	
	INSTALLATION		
		ENGLISH	
		SYSTEM	
			HEAT SOURCE HEATING SYSTEM <i>POOL</i> SHUNT GROUP ADDITION
		SERVICE TIME FACTORY SET RESET OPER. TIME SENSOR CALIBRATION VERSION LOG TIME BRINE TIME ON BRINE TIME OFF TOPH. TIME TOPH. TIME D	
	DEFROST		
		DEFR CURVE 0 DEFR CURVE -XX STOP DEFR BELOW 5°C DEFR MIN TIME DEFR MIN RAD STMP FAN START FAN STOP REFR 3	

13.2.1 Sub menu SERVICE -> HOT WATER

Used to change the settings for hot water production.

Menu selection	Meaning	Factory setting
START	Start temperature for hot water production. Shows the actual weighted hot water temperature and the value within brackets indicates the start temperature. (☺ = no sensor alarm)	☺ (interval: ☺, 30°C / 55°C)
HOT WATER TIME	Time for hot water production during combined hot water and heating demand, in minutes.	40M (up to 8kW) 20M (10kW and more) (interval: 5M / 40M)
HEATING TIME	Time for hot water production during combined heating and hot water demand, in minutes.	20M (interval: 5M / 40M)
TOPH. INTERVAL	Time interval between peak heating charging, anti-legionella function, in days. Operating mode that permits auxiliary heater must be selected.	7D (interval: ☺, 1D / 90D)
TOPH. STOP	Stop temperature for peak heat charging. Operating mode that permits auxiliary heater must be selected.	60°C (interval: 50°C / 65°C)
INFL. START SEN.	Water heater sensor's influence compared with the peak sensor's at start of water heating.	65% (interval: 0% / 100%)
WEIGHT HOT WATER	The calculated value of the hot water sensor directed towards the peak sensor.	-

13.2.2 Sub menu SERVICE -> HEAT PUMP

Used to change the heat pump's operating settings.

Menu selection	Meaning	Factory setting
INTEGRAL A1	The integral's value for starting the heat pump. See figure in section 11.5 <i>Important parameters</i> for further information.	60 (interval: 5 / 250)
HYSTERESIS	If the difference between the actual supply temperature and the calculated supply temperature is too great either the integral value is set to start value A1 (the heat pump starts) or the value is set to 0 (stops the heat pump).	12°C (interval: 1°C / 15°C)
MAX RETURN	Stop temperature at high return from the heating system.	55°C (interval: 30°C / 70°C)
START INTERVAL	Minimum time interval between two heat pump starts in minutes.	20M (interval: 10M / 30M)
PRESS. PIPE	Sensor on the compressor's pressure pipe line. Value within brackets indicates maximum permitted temperature. If this value is exceeded, the compressor will stop and start again as soon as the temperature has dropped. No alarm shown in the display, however, a square is shown in the left, lower corner of the display.	125°C (interval: 100°C / 160°C)
OUTDOOR STOP	Only appears if AIR is selected. Lowest outdoor temperature when the outdoor sensor stops the compressor and heating or hot water instead produce with auxiliary heater. Operating mode that permits auxiliary heater must be selected.	-16°C (interval: -16°C / -1°C)

13.2.3 Sub menu SERVICE -> AUX. HEATER



Used to change the heat pump stage's operating settings.

Menu selection	Meaning	Factory setting
MAX STEP	Maximum number of permitted steps for auxiliary heating. ☺ = no auxiliary heater permitted (Means that only operating modes AUTO, HEAT PUMP or ☺ can be selected and that anti-legionella operation is not possible.)	☺ (interval: ☺, 1)
INTEGRAL A2	Two conditions must be fulfilled in order to start the auxiliary heater: the integral's value to start must be less than integral A1 + A2, and the supply temperature must be 2° lower than the calculated temperature. See section 11.5 <i>Important parameters</i> for further information.	600 (interval: 50 / 990)

Menu selection	Meaning	Factory setting
HYSTERESIS	If the difference between the actual supply temperature and the calculated supply temperature is too great (see section 11.5 <i>Important parameters</i>), either the integral value is set to start value A1 + A2 (starts the auxiliary heater) or the value is set to 0 (stops the auxiliary heater).	20°C (interval: 5°C / 30°C)
<i>MAX CURRENT</i> (Expansion card)	Refers to main fuse in the unit, in amperes.	20 (interval: 16 / 35)
HOT WATER STOP	Stop temperature for hot water during AUX. HEATER. The value is read off by the hot water sensor.	60°C (interval: 50°C / 65°C)

13.2.4 Sub menu SERVICE -> MANUAL TEST

Used to manually test and test operate the heat pump's components or signal outputs.

Menu selection	Meaning	Factory setting
MANUAL TEST	Setting options for manual test. 0 = deactivate manual test 1 = activate manual test 2 = activate manual test with option of navigating from the SERVICE menu to check that the temperatures rise.	-
HEAT PUMP	0 = stop heat pump 1 = start heat pump.  <u>NOTE! The heat pump cannot be started in the event of an active alarm.</u>	-
COMPR. HEATER	0 = stop compressor heater 1 = start compressor heater	-
CIRC. PUMP	0 = stop circulation pump 1 = start circulation pump	-
REV.V. HOT WATER	0 = heating mode for 3-way valve 1 = hot water mode for 3-way valve	-
AUX. HEAT 1	0 = stop auxiliary heat step 1 1 = start auxiliary heat step 1  <u>Warning! There must be a flow through the auxiliary heater.</u>	-
FAN	0 = stop fan 1 = start fan	-
<i>ALARM</i> (Expansion card)	0 = stop signal on output External alarm 1 = start signal on output External alarm	-
SHUNT GROUP	- = shuts shunt 0 = shunt unaffected + = opens shunt	-
<i>REV. V. POOL</i> (Expansion card)	0 = normal mode for exchange valve 1 = pool mode for exchange valve	-
<i>0-10V</i> (Expansion card)	For any future demands.	

13.2.5 Sub menu SERVICE -> INSTALLATION

Used for settings that are set during installation.

Menu selection	Meaning	Factory setting																	
ENGLISH	<p>Language setting for the control system.</p> <p>The button sequence that is to be pressed to access this menu to change language is shown here:</p> <p>◀ (5 seconds), −, −, −, −, >, >.</p> <p>You are now in the language menu, select language using − or +.</p>	ENGLISH (ĚĚŠTINA, POLSKI, EESTI, SUOMI, DANSK, NORSK, ITALIANO, ESPAÑOL, FRANÇAIS, NEDERLANDS, DEUTSCH, ENGLISH, SVENSKA)																	
SYSTEM	<p>Sub menu SERVICE -> INSTALLATION -> SYSTEM:</p> <table><tr><th>Menu selection</th><th>Meaning</th></tr><tr><td rowspan="3">HEAT SOURCE</td><td>AIR:</td></tr><tr><td><table><tr><th>Menu selection</th><th>Meaning</th></tr><tr><td>DIRECT EVAPORATION</td><td>The actual system with direct evaporation and 4-way valve.</td></tr></table></td></tr><tr><td>HEATING SYSTEM</td><td>VL SYSTEM</td></tr><tr><td>POOL (Expansion card)</td><td>ON / ☹ Cannot be selected if SHUNT GROUP is selected.</td></tr><tr><td>SHUNT GROUP</td><td>ON / ☹ When ON, HEAT CURVE 2 is activated in the INFORMATION menu. Cannot be selected if POOL is selected.</td></tr><tr><td>ADDITION</td><td>0-10V: ☹ (Expansion card) CURRENT LIMITER: ON / ☹ (Expansion card) PHASE FAULT: ☹/ PHASE READING</td></tr></table>		Menu selection	Meaning	HEAT SOURCE	AIR:	<table><tr><th>Menu selection</th><th>Meaning</th></tr><tr><td>DIRECT EVAPORATION</td><td>The actual system with direct evaporation and 4-way valve.</td></tr></table>	Menu selection	Meaning	DIRECT EVAPORATION	The actual system with direct evaporation and 4-way valve.	HEATING SYSTEM	VL SYSTEM	POOL (Expansion card)	ON / ☹ Cannot be selected if SHUNT GROUP is selected.	SHUNT GROUP	ON / ☹ When ON, HEAT CURVE 2 is activated in the INFORMATION menu. Cannot be selected if POOL is selected.	ADDITION	0-10V: ☹ (Expansion card) CURRENT LIMITER: ON / ☹ (Expansion card) PHASE FAULT: ☹/ PHASE READING
Menu selection	Meaning																		
HEAT SOURCE	AIR:																		
	<table><tr><th>Menu selection</th><th>Meaning</th></tr><tr><td>DIRECT EVAPORATION</td><td>The actual system with direct evaporation and 4-way valve.</td></tr></table>	Menu selection	Meaning	DIRECT EVAPORATION	The actual system with direct evaporation and 4-way valve.														
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DIRECT EVAPORATION	The actual system with direct evaporation and 4-way valve.																		
HEATING SYSTEM	VL SYSTEM																		
POOL (Expansion card)	ON / ☹ Cannot be selected if SHUNT GROUP is selected.																		
SHUNT GROUP	ON / ☹ When ON, HEAT CURVE 2 is activated in the INFORMATION menu. Cannot be selected if POOL is selected.																		
ADDITION	0-10V: ☹ (Expansion card) CURRENT LIMITER: ON / ☹ (Expansion card) PHASE FAULT: ☹/ PHASE READING																		
SERVICE TIME	<p>NOTE! Only used for test operation. The heat pump counts 60 times as fast, which means that the waiting times are eliminated during test operation.</p> <p>0 = deactivates SERVICE TIME 1 = activates SERVICE TIME which speeds up the control system's integral calculation and start delay by 60 times.</p>	-																	
FACTORY SET	<p>CANCEL = starting point, no changes made. RADIATOR = reset factory settings for radiator system FLOOR = reset factory settings for under floor heating</p>	-																	
RESET OPER. TIME	<p>0 = no reset of operation times 1 = reset operation times to zero</p>	-																	
SENSOR CALIBRATION	<p>Following sensors are in the installation:</p> <p>OUTDOOR SUPPLY LINE RETURN LINE HOT WATER REFR 1 REFR 2 REFR 3</p> <p>EXTERNAL FACTOR (these parameters affect all sensors except the outdoor sensor. The parameter compensates for the external influence on the sensor that is mounted in the heat pump.</p>																		

Menu selection	Meaning	Factory setting
VERSION	Shows the software version which is stored on the display card respectively the I/O-card. DISPLAY: V n.n I/O-CARD: V n.n	-
LOG TIME	Time interval between collection points of temperature history in minutes. The history graphs always show the 60 last collection points, which means that the graphs can display history from 1 hour up to 60 hours ago. (The function is not active if there is an active alarm).	1M (interval: 1M / 60M)
TOPH. TIME	☹ = Deactivates time period for peak heat charging. ON = Activates time period for peak heat charging.	☹

13.2.6 Sub menu SERVICE -> DEFROST

Used to change settings for heat pump defrost.

Menu selection	Meaning	Factory setting
DEFR CURVE 0	The temperature of the heat pump's incoming refrigerant at which defrosting should start, at 0°C outdoor temperature is set here, using + or -. The graph can be changed up or down at 0°C outdoor temperature in the display. See section 11.5 <i>Important parameters</i> for further information.	-10°C (interval: -16°C / 0°C)
DEFR CURVE -XX	The temperature of the heat pump's incoming refrigerant at which defrosting should start, at the set outdoor temperature for OUTDOOR STOP is set here, using + or -. The setting is made by reducing the OUTDOOR STOP value by this value. The number of degrees shown after DEFR CURVE in the display is the set value for OUTDOOR STOP. The combined temperature is shown in the top right corner of the display. The graph can be changed up or down at the outdoor temperature OUTDOOR STOP in the display. See section 11.5 <i>Important parameters</i> for further information.	OUTDOOR STOP reduced by 4°C (interval: -5°C / -1°C)
STOP DEFR	The temperature that must be reached on incoming refrigerant to complete a defrost.	30°C (interval: 7°C / 60°C)
BELOW 5°C DEFR	Safety defrosting occurs when the outdoor temperature has been below 5° for a set number of days.	7D (interval: ☹, 1D / 14D)
MIN TIME DEFR	Minimum time between two defrosts in minutes.	45M (interval: 10M / 60M)
MIN RAD STMP	Minimum permitted supply temperature during defrost, at which the electric auxiliary heater engages.	20°C (interval: 16°C / 30°C)
FAN START	The fan starts when the temperature of the incoming refrigerant to the heat pump reaches the set value. If FAN START is set to ON, the fans starts and stops at the same time as the compressor and the FAN STOP parameter is inactive.	-2°C (interval: ON, -5°C / FAN STOP-3°C)
FAN STOP	The fan stops when the temperature of the incoming refrigerant to the heat pump reaches the set value.	17°C (interval: FAN START+3°C / 30°C)
REFR 3	Shows the temperature at refrigerant sensor 3.	

14 Noise information

14.1 Flexible hoses

All pipes should be routed in such a way that vibrations cannot be transmitted from the heat pump through the piping and out into the building. This also applies to the expansion pipe. To avoid the transmission of vibrations, we recommend that flexible hoses are used for the supply line and return line on both the heating system and brine system sides. Flexible hoses are available to purchase as accessories. The figures below show how appropriate and inappropriate installations look using this type of hose.

To avoid noise caused by pipe mounting, rubber-coated clamps should be used to prevent the transmission of vibrations. However, installation should not be too rigid and the clamps must not be too tight.

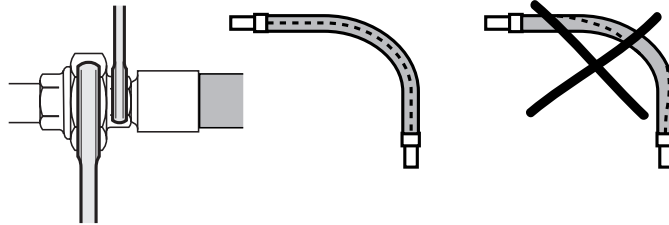


Figure 29: Do not twist the flexible hoses as they are installed. At threaded connections, use a counterhold spanner.

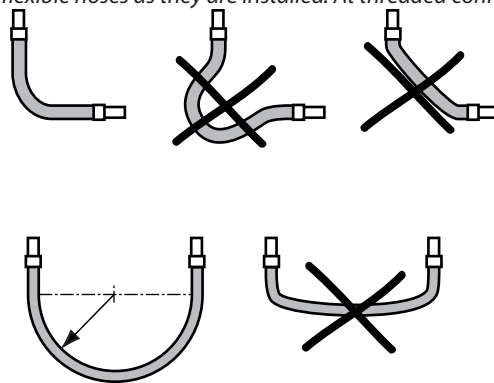


Figure 30: Cut the hose to the correct length to avoid excess bowing-out or stretching at bends.

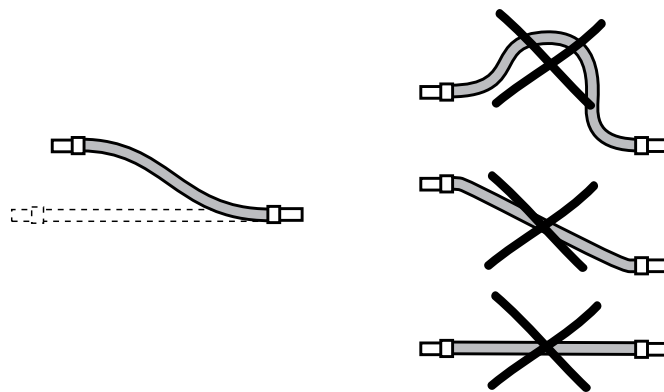


Figure 31: Cut the hose to the correct length to avoid excess bowing-out or stretching and offset the ends so that the hose is not installed completely straight.

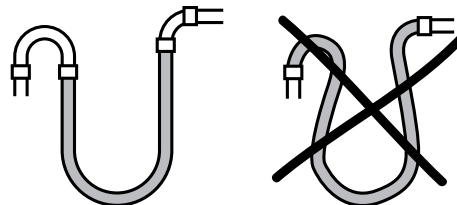


Figure 32: Use fixed pipe bends to avoid excess stress on bends next to connections.

14.2 Preventative measures

Some of the following points can also be used when troubleshooting.

- Do *not* install heat pumps on walls adjoining bedrooms.
- Ensure that *all* pipes are elastically suspended, with mountings as illustrated or similar. This is so that the rubber (or similar material) compresses 1–2 mm under vibration. It is not recommended to suspend the pipes from too many points, as the force at each mounting is then not sufficient.

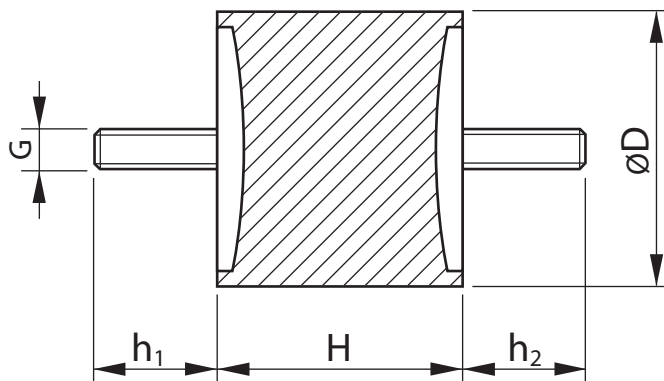


Figure 33: Example of rubber mounting.

- If the ceiling of the boiler room is unsuitable for suspending the aforementioned pipe mountings from, set up (or construct) special stands on the floor from which the pipes can be suspended.
- Ensure that the refrigerant pipes and similar pipes do not lie against walls that they run along and that foam insulation is wrapped around the entire pipe, not just on top of it.
- Pipes inside the heat pump must not be against each other (if they are, clamp and secure suitable rubber, pulling the pipes apart by hand only helps temporarily).
- Place the heat pump on rubber feet or synthetic vibration dampers designed for its weight.
- Do not forget flexible hoses, preferably lengths that enable them to be routed in a loop. If necessary, use rubber straps to secure flexible hoses in position, so that they do not lie against each other or create vibration bridges.
- Ensure that electrical wiring is not put under strain, if it is it creates vibration bridges.
- If possible, prevent placing the heat pump in a cold cellar with hard concrete walls and unsuitable acoustics (test by clapping your hands; if there is a clear echo, the acoustics are unsuitable). The cellar can be furnished or noise insulated. Check that the air intake for the boiler room is soundproofed to some extent (damper or similar).

Soundproofing measures to carry out afterwards:

- Go through the aforementioned points and improve when possible.
- Hood for compressor (most effective for high frequencies).
- Improve the acoustic environment by installing acoustic panels on walls and in the ceiling.
- In some instances, it is recommended to move the heat pump to another room.
- In rare instances, it may be worth replacing the compressor.

15 Troubleshooting

15.1 Alarm

Shown in display in the event of an alarm. To reset alarms 1-5, set the operating mode to OFF or cut the power supply.

Message	Meaning
HIGH PRESSURE ERROR	Tripped high pressure switch. Compressor stopped. No hot water production.
LOW PRESSURE ERROR	Tripped low pressure switch. Compressor stopped. No hot water production.
MOTOR P ERROR	Deployed motor protection (Over current relay compressor), or deployed motor protection for outdoor unit fan. Compressor stopped. No hot water production.
OUTDOOR SENSOR	Fault in outside sensor. When the control system calculates the heat demand, zero degrees is used.
SUPPLY LINE SENSOR	Supply line sensor error. Everything stops except the heating system's circulation pump.
RETURN LINE SENSOR	Return sensor fault. Return temperature = Supply line – 5 is used. Calculated supply temperature limited to maximum 45°C.
HOT WATER SENSOR	Fault on sensor for start temperature. No hot water production.
ERR PHASE SEQ.	Alarm that indicates that there is an incorrect phase sequence to the compressor. Only display and only the first 10 minutes.
HIGH RETURN	Alarm that indicates that high return temperature prevents the compressor's operation.
RAD FLOW LOW	The flow sensor produces an alarm when the water flow in the heating system becomes too low.

15.2 Measurement points

Conversion table for sensors



When reading the resistance of the sensors, the sensor leads must first be disconnected from the control equipment.

Outdoor sensor	
°C	Ohm, Ω
-30	1884
-25	1443
-20	1115
-15	868
-10	681
-5	538
0	428
5	343
10	276
15	224
20	183
25	150
30	124
35	103
40	86

Other sensors	
°C	Kiloohm, kΩ
0	66,3
5	52,4
10	41,8
15	33,5
20	27,1
25	22,0
30	18,0
35	14,8
40	12,2
45	10,1
50	8,5
55	7,1
60	6,0
65	5,0
70	4,2
75	3,7
80	3,1
85	2,7
90	2,3
95	2,0

1. Disconnect the sensor cable at the I/O card.
2. First measure the sensor including the cable.
3. Then measure the sensor only.

15.3 Check points

Temperatures

Name	Values
Condensing temperature	0.5 – 1.5 °C above supply line temperature
Evaporation temperature	7 - 8 °C lower than incoming brine
Overheating	4 - 8 K temperature difference
Radiator circuit	5 - 10 K temperature difference
Overheating R407C	4K ±1 K

Break pressure pressure switches

Refrigerant	Pressostat	Break pressure
R407C	Low pressure pressostat	0.08 MPa
	Operating pressure switch A	2.65 MPa
	Operating pressure switch B	2.85 MPa
	High pressure pressostat	3.10 MPa

15.4 Operational problems



The tables in the following section apply to all types of heat pump and collector solutions. This means that certain information does not apply to DHP-AX.

The tables have the most probable and most common causes of the problem listed first. When troubleshooting the cause of a problem start with the first cause and go down the list. There may be more than one way of troubleshooting a cause where the most probable is given first.

15.4.1 Alarm

Problem – Alarm LP (low pressure pressure switch)

Cause	Troubleshooting	Remedy
1. Blocked strainer on the brine circuit.	Check that the strainer is not blocked.	Clean the strainer if necessary.
2. Air in the brine circuit.	Listen for air in the heat pump and brine circuit.	Bleed the brine circuit according to the installation instructions.
3. Closed taps, main tap or filler cock on the brine circuit.	Check that the shut-off cock/any other taps are open.	Open closed taps.
4. The circulation pump for the brine circuit is defective or has jammed.	Check: <ul style="list-style-type: none"> • That the circulation pump spins. • That the shut-off valves are open. • That the strainer is not blocked. • That no air is in the heating system. 	<p>The circulation pump may have jammed, if so, open the bleed screw and try to release the paddle wheel using a screw-driver for example.</p> <p>Open closed valves or taps.</p> <p>Check, and, if necessary, clean the strainer.</p> <p>If necessary, bleed the heating system according to the installation instructions</p>
5. Cable break or loose cable to low pressure pressure switch.	<ul style="list-style-type: none"> • Check that both cables are connected on the pressure switch. • Using the buzzer, check that there are no cable breaks. In order to do this, disconnect the cables from the pressure switch and circuit board. 	<p>If a cable has come loose, connect it.</p> <p>If there is a cable break, replace the cable.</p>
6. Low pressure pressure switch opens too soon.	<ul style="list-style-type: none"> • Incorrect pressure switch installed. Higher break pressure than intended. See marking. • Pressure switch fault, opens at a higher pressure than indicated (mark pressure). Check using the manometer apparatus. • Defective pressure switch, always open. 	If the low pressure pressure switch opens too soon or is always open, replace it.
7. Incorrect type of anti-freeze, must be in accordance with instructions.	Check that the correct type of anti-freeze is used.	If the incorrect type of anti-freeze is used, the entire system must be drained and refilled with a new mixture.

Cause	Troubleshooting	Remedy
8. Incorrect mix of anti-freeze, the concentration must be in accordance with instructions.	Check the freezing point of the mix using a refractometer.	If the mixture is not in accordance with the instructions, it must be remixed in an external container. This is because the fluids do not mix with each other well if one is filled directly into the system.
9. Short active collector, e.g. short or dry bore hole, short surface soil collector.	<ul style="list-style-type: none"> • Check the length of the collector that is being used and compare with the collector length in the dimensioning documentation. • In addition, check that the collector is not suspended "in free air" if boreholes are used. 	If the active collector is too short, the heat pump cannot receive enough energy from the heat source, which results in it requiring an addition to cover the energy requirement.
10. Collector too long, pressure drop too great.	Check the length of the collector that is being used and that it is connected in parallel (not connected in series) if more than 1 coil is being used.	If a longer collector is being used than recommended for the specific heat pump, it must be divided on several parallel connected coils.
11. Expansion valve defective or incorrectly set.	<p>Using manometer apparatus and thermometer check what the overheating reading of the unit is.</p> <p>Also check that bulb and capillary tube are undamaged and that the bulb is correctly installed.</p>	<p>If the overheating reading does not correspond with the instructions for the specific refrigerant, adjust the expansion valve until the correct value is obtained. See separate instructions for cooling techniques.</p> <p>If overheating cannot be adjusted with the expansion valve or if the capillary tube/bulb is damaged, replace it.</p>
12. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	<p>Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant.</p> <p>If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action.</p>
13. Drying filter blockage.	Check the temperature difference above the drying filter. A one degree difference is permissible. If the difference is greater than 1 degree, the filter is blocked. Take a reading during operation.	If the drying filter is sealed, replace it.
14. Blocked evaporator on the water side.	<p>If there is no strainer in the brine circuit, there is a risk of dirt sticking in the evaporator and blocking it. Unfortunately there is no easy way of checking if the evaporator is blocked.</p> <p>You can carry out a test by allowing the compressor and circulation pumps to remain in operation. Check that the circulation pumps work (for circ.pumps with a bleed screw, unscrew it and feel if the pump rotor rotates using a screwdriver).</p> <p>Then read the temperature on both connection pipes to the evaporator:</p> <p>If the temperature difference is <1°C, the evaporator is probably blocked.</p> <p>If the temperature difference is 2-6°C, it is probably not blocked.</p> <p>If the temperature difference is >6°C, the evaporator is probably blocked.</p>	If the evaporator is thought to be blocked, try flushing it. If this does not work, it must be replaced.

Cause	Troubleshooting	Remedy
15. Blocked evaporator on the refrigerant side.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	If the evaporator is thought to be blocked by oil for example, try blowing nitrogen through it to release the oil. If this does not work, it must be replaced

Problem – Alarm HP (high pressure pressure switch)

Cause	Troubleshooting	Remedy
1. Blocked strainer in the heating system.	Check that the strainer is not blocked.	Clean the strainer if necessary.
2. Air in the heating system.	Listen for air in the heat pump and heating system.	Bleed the heating system according to the installation instructions.
3. Closed or partially closed thermostats/valves in the heating system.	Check that the thermostats/valves in the heating system are open.	Open closed thermostats/valves.
4. The circulation pump that is defective or has jammed.	Is there voltage to the circulation pump?	<p>In the control system's manual test menu check that the circulation pump is active.</p> <p>Check if there is voltage to the circulation pump, if there is, and it does not run, the circulation pump is jammed. If this is the case, open the bleed screw and try to release the paddle wheel using a screwdriver for example (Does not apply to heat pumps in the Optimum series).</p> <p>If there is no voltage to the circulation pump, check if there is voltage from the I/O card, see wiring diagram. If there is voltage from the I/O card, check the components between the I/O card and the circulation pump.</p> <p>If a component is defective, replace it.</p>
5. Shut-off main tap in heating system.	Check that the main tap is open.	Open closed main tap.
6. Cable break or loose cable to high pressure pressure switch.	<ul style="list-style-type: none"> • Check that both cables are connected on the pressure switch. • Using the buzzer, check that there are no cable breaks. In order to do this, disconnect the cables from the pressure switch and circuit board. 	<p>If a cable has come loose, connect it.</p> <p>If there is a cable break, replace the cable.</p>
7. The operating pressure switch does not open.	<ul style="list-style-type: none"> • Incorrect pressure switch installed. Same or higher break pressure than high pressure pressure switch. See marking. • Pressure switch fault, opens at a higher pressure than indicated (mark pressure). Check using the manometer apparatus. • Defective pressure switch, never opens. 	If the operating pressure switch does not open, replace it.
8. The high pressure pressure switch opens too soon.	<ul style="list-style-type: none"> • Incorrect pressure switch installed. As low or lower break pressure than operating pressure switch. See marking. • Pressure switch fault, opens at a lower pressure than indicated (mark pressure). Check using the manometer apparatus. • Defective pressure switch, always open. 	If the high pressure pressure switch opens too soon or is always open, replace it.

Cause	Troubleshooting	Remedy
9. External system shunt that closes on time setting.	Check for shunts or valves in the system, which are timer-controlled, that close down the entire or too large a part of the heating system.	Always ensure that there is a sufficiently large water volume for the heat pump to work against, i.e. for the heat to give off its heat to.
10. Incorrectly facing non-return valve with too high opening pressure.	<ul style="list-style-type: none"> • Check the system's direction of flow and that the non-return valve is turned the correct way. • Check that the heat pump's external available pressure exceeds the non-return valve's opening pressure. 	<p>If the non-return valve is facing the wrong way, turn it.</p> <p>If the non-return valve has too great an opening pressure, replace it.</p>
11. Large pressure drop in the heating system.	<ul style="list-style-type: none"> • Dirt in the heating system. • Closed or partially closed thermostats/valves in the heating system. • Under dimensioned pipe system. Check that the HP's external available pressure exceeds the system pressure drop. 	<p>If necessary, clean/flush the heating system.</p> <p>Open closed thermostats/valves.</p> <p>If there is not sufficient pressure equipment, the heating system can be adjusted according to the system solution for large pressure drop.</p>
12. Overfilled refrigerant circuit.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	<p>Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant.</p> <p>If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action.</p>
13. Blocked condenser on the water side.	<p>If there is no strainer in the heating system, there is a risk of dirt sticking in the condenser and blocking it. Unfortunately there is no easy way of checking if the condenser is blocked.</p> <p>You can carry out a test by allowing the compressor and circulation pumps to remain in operation and after a while, check that the pressure pipe becomes hot and that the circulation pumps work (for circ.pumps with a bleed screw, unscrew it and feel if the pump rotor rotates using a screwdriver).</p> <p>Then read the temperature on both connection pipes to the condenser:</p> <p>If the temperature difference is $<3^{\circ}\text{C}$, the condenser is probably blocked.</p> <p>If the temperature difference is $3\text{--}13^{\circ}\text{C}$, it is probably not blocked.</p> <p>If the temperature difference is $>13^{\circ}\text{C}$, the condenser is probably blocked.</p>	If the condenser is thought to be blocked, try flushing it. If this does not work, it must be replaced
14. Blocked condenser on the refrigerant side.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	If the condenser is thought to be blocked by oil for example, try blowing nitrogen through it to release the oil. If this does not work, it must be replaced

Problem – Alarm MS (motor protection)

Cause	Troubleshooting	Remedy
1. Phase drop or blown fuse.	<p>Check that all phases are present on the terminal block for incoming supply. If not, check the fuses in the cabinet.</p> <p>Also check that all wiring is secure, if screw terminals are used they must be properly tightened, if phoenix flat spring terminals are used, the cables must be secure in the correct hole with load on the cable.</p>	If any of the phases are not present, check backwards towards the building's main electrical cabinet. If there are no phases there, contact the network supplier.
2. Defective soft-starter.	Measurement check and establish that when the I/O card gives a signal (there must be voltage between A1 & A2 on the soft-starter), the soft-starter releases all three phases down to the compressor.	If the soft-starter does not release the phases when it receives signals from the I/O card, replace it.
3. Defective contactor.	Measurement check and establish that when the I/O card gives a signal (there must be voltage between A1 & A2 on the contact), the contact releases all three phases down to the compressor.	If the contact does not release the phases when it receives signals from the I/O card, replace it.
4. Defective or incorrectly set motor protection.	Use a hook-on meter to establish when the motor protection deploys, check what the motor protection is set to. Compare with the table.	<p>If the motor protection is defective, replace it.</p> <p>If incorrectly set, adjust to the correct value.</p>
5. Cable break.	Check the supply to the motor protection//soft-starter/compressor.	If a cable is damaged, replace it.
6. Defective compressor.	Measurement check the voltage on the three phases (each to zero) at the compressor. Deviations from the average of the three values should not be more than 12% on any of the phases. If measurement checking the winding's impedance the same value must be on all three windings.	If the compressor is defective, replace it.

Problem – Alarm sensor (all)

Cause	Troubleshooting	Remedy
Sensor fault alternatively cable fault.	<ul style="list-style-type: none"> • When reading the resistance of the sensors, the sensor leads must first be disconnected from the control equipment or terminal block. • First take a reading from the sensor including cable and check against the ohm table in section 15.3 <i>Measurement points</i>. • If the read off value does not correspond with the table, only measure the sensor and check the ohm table in section 15.3 <i>Measurement points</i>. 	<p>If the sensor gives a correct value, the cable is defective.</p> <p>If the sensor does not give a correct value, the sensor is defective.</p>

Problem – Incorrect phase sequence

Cause	Troubleshooting	Remedy
The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps).	<ul style="list-style-type: none">• If the text ERR PHASE SEQ. appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence.• When the compressor is running, check the pressure pipe temperature by feeling the pressure pipe. If the phases are correctly sequenced it should be hot (not just warm) even a distance from the compressor .• When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards.	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.

Problem – Alarm AH (addition)

Cause	Troubleshooting	Remedy
1. The overheating protection has tripped.	Check if the overheating protection has tripped.	If the overheating protection has tripped, reset it.
2. Phase drop. The alarm occurs when 230 V is not registered between L2 on the circuit board and N (220).	<ul style="list-style-type: none">• Check if the overheating protection has tripped.• Check if any cables at the circuit board or overheating protection are loose or damaged.	If the overheating protection has tripped, reset it. If the cables are loose/damaged, secure or replace them.
3. Overheating protection fault, cannot be reset.	Press the reset button, measurement check for 230 V on the incoming and outgoing connections.	If the overheating protection is defective, replace it.
4. Flow sensor fault.	Check what the flow sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in section 15.3 <i>Measurement points</i> .	If the sensor is defective, replace it.
5. No or insufficient circulation in the heating system.	Check: <ul style="list-style-type: none">• That the circulation pump spins.• That the shut-off valves are open.• That the strainer is not blocked.• That no air is in the heating system.	The circulation pump may have jammed, if so, open the bleed screw and try to release the paddle wheel using a screwdriver for example. Open closed valves or taps. Check, and, if necessary, clean the strainer. If necessary, bleed the heating system according to the installation instructions
6. The submersible tube in the electric heating element is against the coils.	Check what the flow temperature is when the overheating protection trips. This normally trips at 95°C.	The submersible tube can be prised out slightly from the coils using a screwdriver or similar. The submersible tube must be vertical.

Problem – Alarm Brine out

Cause	Troubleshooting	Remedy
1. Defective sensor.	Check what the sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in section 15.3 <i>Measurement points</i> .	If the sensor is defective, replace it.

Cause	Troubleshooting	Remedy
2. Brine temperature too low.	Check the set value on ALARM BRINE in the heat pump's control computer.	The alarm is triggered when the temperature on BRINE OUT is as low or lower than the set value on ALARM BRINE. In the factory setting this function is inactive.

Problem – Alarm Brine flow low

Cause	Troubleshooting	Remedy
1. Incorrect system selected in the control system. If the system does not contain a flow sensor but the control system is set for the system with flow sensor (e.g. VL+F), this alarm occurs.	In the menu SYSTEM, check which is selected.	If the incorrect system is selected, change it.
2. Insufficient flow.	<ul style="list-style-type: none"> • Check whether the ground water pump is running? • Check the flow switch. • Calibration/setting the flow switch. • Blocked exchanger? 	<p>The ground water pump must start and run together with the heat pump's integrated brine pump.</p> <p>Check against the wiring diagram that the flow switch is correctly connected.</p> <p>Check that the flow switch is set for the correct working range according to the flow switch instructions.</p> <p>If the exchanger is blocked, clean or replace it.</p>

Problem – Operating pressure switch open alternatively high hot gas temperature

(indicated by □ in the display's lower left-hand corner)

Cause	Troubleshooting	Remedy
1. The operating pressure switch does not close again.	<ol style="list-style-type: none"> 1. Switch off the main switch for the heat pump, wait until the compressor has been stationary for at least 15 minutes. 2. Disconnect the two cables on the pressure switch, using a buzzer check if the pressure switch is closed. 	<p>If the pressure switch is closed, bridge the pressure switch cables temporarily and switch on the current to the heat pump again. If there is an indication □ in the display this means that the pressure switch is fault-free and the problem is in the wiring or in the circuit board.</p> <p>If the pressure switch is open, try carefully tapping the head of the pressure switch with a screwdriver and use a buzzer test to see if it has closed again.</p> <p>Replace the pressure switch if it appears to jam repeatedly.</p>
2. Sensor fault, shows >120°C	<p>Check what the sensor shows, is it a plausible/actual value?</p> <p>Measure the resistance of the sensor, check against the ohm table in section 15.3 <i>Measurement points</i>.</p>	If the sensor is defective, replace it.
3. Hot gas temperature too high.	Check the set value on PRESS. PIPE in the heat pump's control computer (factory setting 130°C)	The square symbol appears when the pressure pipe temperature is as high or greater than the set value for PRESS. PIPE.

Cause	Troubleshooting	Remedy
4. Overheating too high.	Using manometer apparatus and thermometer check what the overheating reading of the unit is. Also check that bulb and capillary tube are undamaged and that the bulb is correctly installed.	If the overheating reading does not correspond with the instructions for the specific refrigerant, adjust the expansion valve until the correct value is obtained. See separate instructions for cooling techniques. If overheating cannot be adjusted with the expansion valve or if the capillary tube/bulb is damaged, replace it.
5. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.

15.4.2 Leakage

Problem – Leak fluid side

Cause	Troubleshooting	Remedy
1. Insufficiently tightened connections.	Locate the leak.	<ul style="list-style-type: none"> • Tighten the connection and check that it is sealed • If it is still not sealed, replace the entire connection and support sleeve (only at soft pipes)
2. Cracked nut or connection.	Locate the leak.	Replace nut or connection.
3. Defective gasket or O-ring.	Locate the leak.	Replace the gasket or O-ring.
4. There is no overflow pipe connected to the safety valve(s).	Establish which safety valve does not have an overflow pipe.	Install an overflow pipe according to the applicable norms.
5. Filler valve between incoming cold water and heating system not closed or leaking.	Check whether water continuously leaks from the safety valve on the expansion vessel on the hot side.	Try closing the filler valve and see if water stops dripping from the safety valve, if not, replace the filler valve.
6. No condensation drain to heat pump's drip tray.	Check that condensation drain is installed and correctly connected.	Install the condensation drain that runs out into the floor drain.
7. Lack of condensation insulation on cold water pipe and/or brine pipe.	Establish where the condensation is coming from.	The brine pipe must always be insulated. In the event of problems with condensation on the cold water pipes, insulate them. Condensation often accumulates in joints and angled sections of the insulation. Improve the insulation.
8. Leak at soldered joints.	Locate the leak.	Drain the system of fluid, repair the leak. If the leak is on the connection pipe to the heat exchanger, also drain the refrigerant side.
9. Leak at the condenser's drain cock.	1. Check that the valve is completely closed. 2. Check that the sealed cover is sealed.	If the sealed cover is not sealed, replace the sealed cover or the entire drain tap.
10. Leak at the condenser's bleed valve.	Check that it is completely closed.	If it is fully closed and still leaks, replace it.

Cause	Troubleshooting	Remedy
11. Leak at soldered joint on water heater.	Locate the leak.	If there is a leak at the soldered joint, replace the water heater.
12. Associated leak on the water heater.	<ul style="list-style-type: none"> Establish whether water continuously leaks from the safety valve on the expansion vessel on the hot side. Establish whether water continuously leaks from the safety valve on the cold side. 	If the water heater has a leak, replace it.
13. Associated leakage in the condenser.	<ul style="list-style-type: none"> Check for lack of refrigerant in the unit. Check by smelling by safety valve on the hot side, open the valve and check. 	If the condenser has a leak, replace it.
14. Anti-freeze is forced out of the safety valve on the expansion tank (brine system).	<p>During the winter, water surrounding the hoses in the borehole can freeze. In some cases, the ice can push against the hoses slightly. Due to the reduction in volume in the hose, the anti-freeze fills the expansion tank and eventually forces some fluid out of the safety valve.</p> <p>When the ice in the borehole melts and the hose expands and returns to its original state, a vacuum is generated which results in a reduction in tank level. As the safety valve does not let any air in, the expansion tank can retract inwards due to the vacuum created.</p>	<p>To prevent anti-freeze from being forced out from the safety valve, you can exchange the existing expansion tank for a closed pressure expansion vessel with a greater volume.</p> <p>To prevent the expansion tank retracting inwards, a vacuum valve can be installed in the system.</p>

15.4.3 Noise

Problem – Noise problem in the radiator system

Cause	Troubleshooting	Remedy
1. Flexible hoses missing.	Flexible hoses must be installed according to the instructions.	Install flexible hoses according to the instructions.
2. Incorrectly installed flexible hoses.	Flexible hoses must be installed according to the instructions.	Install flexible hoses according to the instructions.
3. Installing/suspending pipes.	Check if the mountings are too rigid, right type, right sizes and/or installed too close together.	If something seems to be incorrect according to the troubleshooting window, carry out corrective actions.
4. Clicking.	<ul style="list-style-type: none"> Establish when clicking occurs, during heating and/or in connection with completed hot water production? Locate the clicking noises. 	<p>A surge tank can be installed on the supply line to mix the hot water with the existing, slightly cooler, water, before it goes out to the radiators.</p> <p>Try lubricating lead-ins in walls, ceilings and floors with silicone spray.</p>
5. Circulation noise (whistling noise in the heating system).	<p>Check the heating system.</p> <ul style="list-style-type: none"> Closed valves, choke valves, adjuster valves or other restrictions in the radiator system can cause circulation noise. Is the heating system correctly adjusted for flow? Too great a flow in the heating system can cause circulation noise. 	<p>If the incorrect type of valve is used to choke the flow, replace with the correct type.</p> <p>If the heating system is not correctly adjusted, make adjustments.</p> <p>Can the heating system be run at a lower flow?</p>

Problem – Loud compressor noise

Cause	Troubleshooting	Remedy
1. Phase drop. The compressor attempts to start or operates on two phases.	1. Check that there is 400 V between incoming phases on the heat pump. 2. If there is supply to the heat pump, measure the voltage for all electrical components all the way to the compressor, see wiring diagram.	Check where the phase drop is and rectify.
2. Touching pipes – vibrations.	Establish which pipe(s) is/are causing the problem.	Try to release any tensions that cause the vibrations.
3. Compressor fault.	Determine whether the compressor is unusually loud.	If the compressor is defective, replace it.

Problem – Shrieking whistling noise

Cause	Troubleshooting	Remedy
1. Whistling expansion valve.	1. Take overheating readings, adjust to the recommended value. 2. Open and close the valve fully in and out. 3. Adjust the expansion valve to recommended overheating value again.	Check if the noise has stopped, if not, continue with point 2. Continue with point 3. If the problem persists, replace the expansion valve.
2. Noise from the soft-starter.	Measurement check the input and output phases for the soft-starter as well as the control signals from the I/O card, see wiring diagram.	If the soft-starter is defective, replace it.
3. The compressor's IPR valve opens.	The compressor has an integrated IPR valve that opens at 28 ± 3 bar. When the valve opens, pressure equalizes between the compressor's high and low pressure side and a milling/whistling sound is heard. To establish whether the valve opens at the correct pressure, connect a manometer on the high and low pressure side. When the valve opens, this is indicated by the pressure on the low pressure side rising and reaching the pressure on the high pressure side. Check at what pressure the valve starts to open.	If it opens at a too low pressure, replace the compressor.

Problem – Noise – miscellaneous

Cause	Troubleshooting	Remedy
1. Vibrating protective sleeves on the pressure switches.	Establish where the vibration noise is coming from.	Prevent the protection sleeve vibrating by using insulation tape for example.
2. Vibration noise from the electrical installation.	Check for electrical steps or similar devices screwed to the heat pump and wall. These can cause vibrations and noise.	Carry out according to the installation instructions.
3. The heat pump is not level.	Check that the heat pump is level by using a spirit level. Check that the heat pump is supported by all four feet	If the heat pump is not level, adjust using the feet.

15.4.4 Hot water

Problem – Temperature and/or quantity

Cause	Troubleshooting	Remedy
1. Defective 3-way valve motor.	Check the function of the 3-way valve, that it runs between the end positions by running a manual test.	If the motor is defective, replace it.
2. Jammed 3-way valve insert. The valve is not secure and releases hot water to the radiators during hot water production.	Detach the motor and test closing and opening of the valve by pressing the control arm	If the insert jams, remove and clean it, or replace it.
3. Air in TWS coil or water outer jacket.	During hot water production: • Listen for air. • Check the temperature difference between supply and return line.	Bleed the system. A Large temperature difference can indicate air in the system.
4. Start temperature set too high for hot water production.	Check that the start temperature is correctly set. Should not be set above the factory set value.	• If the start value is set too high, reduce it to the factory set value. • If the system has a high (>+8°C) brine temperature, you may have to reduce the start value further for a longer running time.
5. Sensor fault, hot water sensor. Hot water production is started by the hot water sensor.	Check what the hot water sensor (the start sensor) shows, is it a plausible/ actual value? Measure the resistance of the sensor, check against the ohm table in section 15.3 <i>Measurement points</i> .	If the sensor is defective, replace it.
6. Large drain flow (>12l/min).	Check how many litres of hot water (approx. 40°C) per minute drains from the tap. Use a clock and bucket to measure the drain flow.	If the drain water flow is greater than 12l/min, stratification in the water heater is affected, which reduces the hot water capacity. Suggested corrective actions: • Install a pressure reduction valve on the incoming cold water pipe. • Change to a mixer with lower flow. • Adjust the drain flow on the existing mixer, do not open the tap fully.
7. Water heater too small in relation to requirement.	How large is the requirement and what is the capacity of the heater?	Replace with a larger heater or supplement with an extra heater. E.G. supplement with an DWH TWS or an electric heater.
8. The operating pressure switch opens too soon (at too low a pressure). Hot water production ends when the operating pressure switch opens.	Check the break pressure using manometer apparatus.	If the pressure switch opens at the incorrect pressure, replace it. The replacement pressure switch can be installed on the service output (Schrader valve)
9. Insufficient exchange surface to transfer the heat pump's output to the heater. (Only applies to heat pumps with a separate heater)	Is the exchange surface too small? Can the heater cope with the heat pump's output?	Replace with a heater with a larger exchange surface.

Cause	Troubleshooting	Remedy
10. Heat loss in the hot water pipe.	<p>Open the hot water tap, read off the temperature on the outgoing hot water pipe from the heat pump and the temperature of the hot water. The temperature difference measured between the heat pump and hot water indicates the temperature loss.</p> <p>Examples of temperature loss causes:</p> <ul style="list-style-type: none"> • Long water pipes. • Uninsulated hot water pipes. • Hot water pipes routed through cold areas. <p>Other causes that can affect the hot water temperature:</p> <ul style="list-style-type: none"> • Is a mixer valve installed in the system? Temperature set too low on the mixer valve? Leaking mixer valve? • Water tap fault? Leaking thermostat mixer? 	<p>If any problems occur during troubleshooting as per the points, carry out corrective actions.</p> <p>To quickly check that the heat pump's hot water production works as it should, drain the hot water so that the heat pump starts to produce the hot water. When done, read off the temperature on the top sensor and on the start sensor. The top sensor should show a temperature of around 50-55°C and the start sensor around 45-48°C. If, after completed hot water production, these temperatures are obtained, this means that you have the correct temperature and volume of hot water in the water heater.</p>

15.4.5 Heating comfort

Problem – Too cold

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE and MAX settings.	<p>Adjust incorrect values in the heat pump's control computer.</p> <p>ROOM = Desired indoor temperature</p> <p>CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature.</p> <p>MAX = Highest set-point value on the supply line regardless of the outdoor temperature.</p>
2. Incorrect operating mode set in the heat pump's control computer.	Check which operating mode is set.	If the incorrect operating mode is set, change to the desired operating mode.
3. Sensor fault, OUTDOOR/ROOM/SUPPLY LINE/RETURN LINE.	<p>Check what the relevant sensor shows, is it a plausible/actual value?</p> <p>Measure the resistance of the sensor, check against the ohm table in section 15.3 <i>Measurement points</i>.</p>	If the sensor is defective, replace it.
4. The 3-way valve has jammed in hot water mode.	<p>1. Check the function of the 3-way valve motor by test running it manually. If the motor does not shift mode during manual test operation, check that there is voltage to the motor, see wiring diagram.</p> <p>2. Detach the motor and test closing and opening of the valve by pressing the control arm.</p>	<p>1. Is the motor being supplied with voltage according to the wiring diagram in both operating instances? MANUAL TEST – REV.V. HOT WATER 0=Radiator mode, arm out from valve. 1=Hot water mode, arm positioned towards the valve. If there is voltage to the motor but the arm does not shift mode, replace it.</p> <p>2. Take out and clean the jammed insert, or replace with a new insert.</p>
5. Defective electric heating element.	Use a buzzer and check if all coils in the electric heating element are intact.	If the electric heating element is defective, replace it.

Cause	Troubleshooting	Remedy
6. The heat pump has stopped on HIGH RETURN.	<ul style="list-style-type: none"> • Check what the MAX RETURN value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return line sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in section 15.3 <i>Measurement points</i>. 	<p>If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it.</p> <p>If the sensor is defective, replace it.</p>
7. Heat production is stopped by the HYSTERESIS function.	<ul style="list-style-type: none"> • If the flow temperature rises as soon as heat production is stopped by HYSTERESIS before INTEGRAL reaches 0, there may be heating deficit in the house. • Check if heat production stops because the hysteresis value is set too low? (See the installation instructions for factory setting.) • Check if heat production stops because thermostats/valves in the heating system are closed or partially closed? • Check if heat production stops because the heating system is under dimensioned? 	<ul style="list-style-type: none"> • Try increasing the hysteresis value until the heat pump stops on INTEGRAL instead. • Open thermostats/valves in the heating system and check that the heat pump stops on INTEGRAL. • If the heating system is deemed to be under dimensioned, the system must be extended (increase the heat emitting surface).
8. The external auxiliary heater does not start when the heat pump's control computer requests it.	<p>If an external auxiliary heater is used, check that it is correctly installed by test running it in MANUAL TEST – AUX. HEATER - 1.</p> <p>If it does not start at manual test operation, check that the start signal/voltage comes from the heat pump. See wiring diagram.</p>	<p>Connect the external auxiliary heater according to the instructions.</p> <p>Measure the voltage on the I/O card's probe L2 Oil/Electricity.</p>
9. Closed or partially closed thermostats/valves in the heating system.	Check that the thermostats/valves in the heating system are open.	Open closed thermostats/valves.
10. The total output of the heat pump and auxiliary heater is too low in relation to the building's power demand.	<p>What is the building's power demand?</p> <p>What is the output of the heat pump?</p> <p>What is the output of the auxiliary heater, what is it set to?</p>	Ensure that available power is at least as great as the building's power demand.
11. Under dimensioned heating system.	<p>Check existing heating system.</p> <p>What output is it dimensioned for to produce at what supply temperature?</p> <p>What output is required to keep the room warm?</p>	<p>If the heating system is dimensioned for greater supply temperatures than the heat pump can provide, it must be adjusted by increasing the heat emitting surface for example.</p> <p>If the room requires a higher output than the heating system can provide, extend the heating system.</p>

Cause	Troubleshooting	Remedy
12. Changed conditions Have you increased your heating and/or hot water demand?	<ul style="list-style-type: none"> • If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems). 	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Too hot

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE and MIN settings.	<p>Adjust incorrect values in the heat pump's control computer.</p> <p>ROOM = Desired indoor temperature.</p> <p>CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature.</p> <p>MIN = Lowest set-point value on the supply line regardless of the outdoor temperature.</p>
2. Sensor fault, OUTDOOR/ ROOM/SUPPLY LINE.	<p>Check what the relevant sensor shows, is it a plausible/actual value?</p> <p>Measure the resistance of the sensor, check against the ohm table in section 15.3 <i>Measurement points</i>.</p>	If the sensor is defective, replace it.
3. Defective 3-way valve motor. The motor should set the valve to the relevant end position depending on operating conditions. If it does not, hot water from the water heater will mix with the radiator water.	Check the function of the 3-way valve motor by test running it manually. If the motor does not shift mode during manual test operation, check that there is voltage to the motor, see wiring diagram.	<p>Is the motor being supplied with voltage according to the wiring diagram in both operating instances?</p> <p>MANUAL TEST – REV.V. HOT WATER</p> <p>0=Radiator mode, arm out from valve.</p> <p>1=Hot water mode, arm positioned towards the valve.</p> <p>If there is voltage to the motor but the arm does not shift mode, replace it.</p>
4. Jammed 3-way valve insert. If the insert is not sealed, hot water from the water heater will mix with the radiator water.	Detach the motor and test closing and opening of the valve by pressing the control arm.	Take out and clean the jammed insert, or replace with a new insert.

Problem – irregular indoor temperature

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE, MIN, MAX CURVE5, CURVE0, CURVE-5 and HEAT STOP settings.	<p>Adjust incorrect values in the heat pump's control computer.</p> <p>ROOM = Desired indoor temperature</p> <p>CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature.</p> <p>MIN = Lowest set-point value on the supply line regardless of the outdoor temperature (on the condition that heat stop does not apply).</p> <p>MAX = Highest set-point value on the supply line regardless of the outdoor temperature.</p> <p>CURVE5,0,-5 = The supply temperature can be adjusted up or down 5°C at these outdoor temperatures.</p> <p>HEAT STOP = Stops all production of heat when the outdoor temperature is the same as or greater than the set value. To exit heat stop the outdoor temperature must drop to 3°C below the set value.</p>
2. Incorrectly positioned/installed sensors.	Check that outdoor sensors and any room sensors are installed according to the instructions and that they are calibrated.	<ul style="list-style-type: none"> • Check that the room sensor is positioned in a suitable place that is representative of the building and calibrate it if necessary. Avoid placing near external doors, windows and heat sources. • Install the outdoor sensor according to the instructions and calibrate it, if necessary.

15.4.6 Other

Problem – The heat pump runs and runs but never stops

Cause	Troubleshooting	Remedy
1. Air in the heating system.	Listen for air in the heat pump and heating system.	Bleed the heating system according to the installation instructions.
2. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	<p>Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant.</p> <p>If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.</p>
3. Changed conditions Have you increased your heating and/or hot water demand?	<ul style="list-style-type: none"> • If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems). 	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Runs on electric heating element

Cause	Troubleshooting	Remedy
1. Operating mode AUX. HEATER is selected.	If this operating mode is selected, the auxiliary heater is used for heating and hot water production, not the compressor.	If AUX. HEATER mode is selected and you no longer want it, change to AUTO, the heat pump then controls both the compressor and auxiliary heater.
2. The compressor cannot run due to an alarm.	Check the alarm that is indicated in the display.	Rectify the problem and reset the alarm. See section 15.5 <i>Operational problems</i> .
3. The integral value has reached the start level for the auxiliary heater.	Check what the integral value is in the control system.	If the auxiliary heater is in operation because the integral value has counted down to the start value, the computer reacts as it should, see section 11 <i>Heat pump</i> for further information.
4. Peak heat operation (anti-legionella function) is running.	Check if the heat pump runs peak heat. See the instructions for the relevant model.	Peak heat operation occurs in connection with hot water production with the set interval. The compressor should then start to produce hot water and 2 minutes later the auxiliary heater starts, the compressor should then stop and the stop temperature is reached with only the auxiliary heater connected. Take no corrective action.
5. The heat pump has stopped on HIGH RETURN.	<ul style="list-style-type: none"> • Check what the MAX RETURN value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return line sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in section 15.3 <i>Measurement points</i>. 	<p>If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it.</p> <p>If the sensor is defective, replace it.</p>
<p>6. The compressor runs backwards. The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps).</p> <p>If the compressor runs backwards, it will not cope with compressing the refrigerant and therefore does not produce the correct power, which leads to the control system requesting auxiliary heating.</p>	<ul style="list-style-type: none"> • If the text ERR PHASE SEQ. appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the pressure pipe temperature by feeling the pressure pipe. If the phases are correctly sequenced it should be hot (not just warm) even a distance from the compressor. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards. 	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.
7. Changed conditions Have you increased your heating and/or hot water demand?	<ul style="list-style-type: none"> • If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems). 	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – The auxiliary heater is in operation but not the compressor

Cause	Troubleshooting	Remedy
1. Operating mode AUX. HEATER is selected.	If this operating mode is selected, the auxiliary heater is used for heating and hot water production, not the compressor.	If AUX. HEATER mode is selected and you no longer want it, change to AUTO, the heat pump then controls both the compressor and auxiliary heater.
2. Peak heat operation (anti-legionella function) is running.	Check if the heat pump runs peak heat. See the instructions for the relevant model.	Peak heat operation occurs in connection with hot water production with the set interval. The compressor should then start to produce hot water and 2 minutes later the auxiliary heater starts, the compressor should then stop and the stop temperature is reached with only the auxiliary heater connected. Take no corrective action, this is normal.
3. The compressor cannot run due to an alarm.	Check the alarm that is indicated in the display.	Rectify the problem and reset the alarm. See the Operational problem – Alarm, section.
4. The heat pump has stopped on high return.	<ul style="list-style-type: none"> • Check what the MAX value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return line sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in the Measurement points section. 	<ul style="list-style-type: none"> • If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it. • If the sensor is defective, replace it.
5. The compressor has been stopped by the operating pressure switch or pressure pipe sensor.	<p>Check if a square appears in the display's lower left corner, if so, the operating pressure switch is open or the pressure pipe sensor triggers an alarm for too high temperature.</p> <ul style="list-style-type: none"> • The operating pressure switch is most easily checked by using a buzzer to see if it is connected. • The pressure pipe sensor value is read off from the control system in the HEAT PUMP menu. Is it a plausible/actual value? If not, take a resistance reading from the sensor and check against the ohm table in the Measurement points section. • The compressor has been stopped by the pressure pipe sensor and you have established that it shows the correct temperature. This may have been caused by a leak in the refrigerant circuit. 	<p>If the operating pressure switch has stuck in the open position, try gently tapping on the pressure switch head. If this does not help, or it sticks in the open position repeatedly, replace the pressure switch.</p> <p>If the pressure pipe sensor is defective, replace it.</p> <p>If the pressure pipe temperature gets so hot that the compressor stops, start by leak-tracing the unit. Rectify the leak, if a leak is found. If no leak is found, try draining and refilling the unit and then restarting the heat pump and seeing what the pressure pipe temperature is. If the problem persists, replace the compressor.</p>
6. The built-in overheating protection (bi-metal protection) in the compressor has tripped.	Check if the heat pump's control computer indicates that the compressor is in operation, and if there is voltage between soft-starters A1 and A2. Then read off and check that there is voltage on the compressor's three electrical connections (L1, L2 and L3).	If there is voltage on the compressor's three electrical connections and the overheating protection does not close when the compressor has not run and has cooled down for at least 1 hour, replace the compressor.

Cause	Troubleshooting	Remedy
7. The compressor runs backwards. The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps). If the compressor runs backwards, it will not cope with compressing the refrigerant and therefore does not produce the correct power, which leads to the control system requesting auxiliary heating.	<ul style="list-style-type: none"> • If the text ERR PHASE SEQ. appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the pressure pipe temperature by feeling the pressure pipe. If the phases are correctly sequenced it should be hot (not just warm) even a distance from the compressor. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards. 	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.

Problem – The heat pump consumes too much energy

Cause	Troubleshooting	Remedy
1. Blocked strainer in the heating system.	Check that the strainer is not blocked.	Clean the strainer if necessary.
2. The compressor cannot run due to an alarm.	Check the alarm that is indicated in the display.	Rectify the problem and reset the alarm. See the Operational problem – Alarm, section.
3. Incorrect flow over hot side of the heat pump.	Measurement check what the difference between the supply and return line is using a thermometer (Δt). The difference should be about 7-10°C (can vary depending on refrigerant). A lower Δt results in reduced efficiency in the heat pump.	Adjust the system to obtain the correct Δt .
4. Incorrect flow in the brine circuit.	Measurement check what the difference between the supply and return line is using a thermometer (Δt). The difference should not be more than 4°C. A greater Δt results in reduced efficiency in the heat pump.	If the difference is greater than 4°C note what is causing it. E.G.: Dirt in the filter, system restrictions, system with high pressure drop.
5. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE and MIN settings.	<p>Adjust incorrect values in the heat pump's control computer.</p> <p>ROOM = Desired indoor temperature.</p> <p>CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature.</p> <p>MIN = Lowest set-point value on the supply line regardless of the outdoor temperature.</p>
6. The interval for peak heat operation has changed to a lower value than the factory set value. This results in the heat pump going into peak heat operation more often than calculated.	Check the specified interval for peak heat operation in the control computer, see instructions for relevant model.	If there is a shorter interval between the peak heat productions, this explains why the unit consumes more current than calculated, but this does not mean for sure that it should be increased, there might be a reason why the interval has been changed.

Cause	Troubleshooting	Remedy
7. The heat pump has stopped on HIGH RETURN.	<ul style="list-style-type: none"> • Check what the MAX RETURN value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return line sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in the Measurement points section. 	<p>If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it.</p> <p>If the sensor is defective, replace it.</p>
8. The compressor runs backwards. The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps). If the compressor runs backwards, it will not cope with compressing the refrigerant and therefore does not produce the correct power, which leads to the control computer requesting auxiliary heating.	<ul style="list-style-type: none"> • If the text ERR PHASE SEQ. appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the pressure pipe temperature by feeling the pressure pipe. If the phases are correctly sequenced it should be hot (not just warm) even a distance from the compressor. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards. 	<p>If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.</p>
9. The compressor has been stopped by the operating pressure switch or pressure pipe sensor.	<p>Check if a square appears in the display's lower left corner, if so, the operating pressure switch is open or the pressure pipe sensor triggers an alarm for too high temperature.</p> <ul style="list-style-type: none"> • The operating pressure switch is most easily checked by using a buzzer to see if it is connected. • The pressure pipe sensor value is read off from the control computer in the HEAT PUMP menu. Is it a plausible/actual value? If not, take a resistance reading from the sensor and check against the ohm table in the installation instructions. • The compressor has been stopped by the pressure pipe sensor and you have established that it shows the correct temperature. This may have been caused by a leak in the refrigerant circuit. 	<p>If the operating pressure switch has stuck in the open position, try gently tapping on the pressure switch head. If this does not help, or it sticks in the open position repeatedly, replace the pressure switch.</p> <p>If the pressure pipe sensor is defective, replace it.</p> <p>If the pressure pipe temperature gets so hot that the compressor stops, start by leak tracing the unit. Rectify the leak, if a leak is found. If no leak is found, try draining and refilling the unit and then restarting the heat pump and seeing what the pressure pipe temperature is. If the problem persists, replace the compressor.</p>
10. Expansion valve defective or incorrectly set.	<p>Using manometer apparatus and thermometer check what the overheating reading of the unit is.</p> <p>Also check that bulb and capillary tube are undamaged and that the bulb is correctly installed.</p>	<p>If the overheating reading does not correspond with the instructions for the specific refrigerant, adjust the expansion valve until the correct value is obtained. See separate instructions for cooling techniques.</p> <p>If overheating cannot be adjusted with the expansion valve or if the capillary tube/bulb is damaged, replace it.</p>
11. Lack of refrigerant, not enough refrigerant in the system.	<p>Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.</p>	<p>If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.</p>

Cause	Troubleshooting	Remedy
12. Overfilled refrigerant circuit.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant.
13. Short active collector, e.g. short or dry bore hole, short surface soil collector.	<ul style="list-style-type: none"> • Check the length of the collector that is being used and compare with the collector length in the dimensioning documentation. • In addition, check that the collector is not suspended "in free air" if boreholes are used. 	If the active collector is too short, the heat pump cannot receive enough energy from the heat source, which results in it requiring an addition to cover the energy requirement.
14. Changed conditions Have you increased your heating and/or hot water demand?	<ul style="list-style-type: none"> • If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems). 	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Auxiliary heater cuts in too soon

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM, CURVE, INTEGRAL A1 and INTEGRAL A2 settings	<p>Adjust incorrect values in the heat pump's control computer.</p> <p>ROOM = Desired indoor temperature.</p> <p>CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature.</p> <p>INTEGRAL A1 = Start value for the compressor.</p> <p>INTEGRAL A2 = Start value (calculated from A1) for the auxiliary heater.</p>
2. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.
3. Short active collector, e.g. short or dry bore hole, short surface soil collector.	<ul style="list-style-type: none"> • Check the length of the collector that is being used and compare with the collector length in the dimensioning documentation. • In addition, check that the collector is not suspended "in free air" if boreholes are used. 	If the active collector is too short, the heat pump cannot receive enough energy from the heat source, which results in it requiring an addition to cover the energy requirement.
4. Collector too long, pressure drop too great.	Check the length of the collector that is being used and that it is connected in parallel (not connected in series) if more than 1 coil is being used.	If a longer collector is being used than recommended for the specific heat pump, it must be divided on several parallel connected coils.

Cause	Troubleshooting	Remedy
5. Changed conditions Have you increased your heating and/or hot water demand?	<ul style="list-style-type: none"> • If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems). 	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Short operating times despite heating demand

Cause	Troubleshooting	Remedy
ROOM and/or CURVE set too high in combination with a heating system with poor circulation due to closed radiator valves, too small elements or insufficient water volume. A tight fitting system with poor pipe dimensions may produce the same phenomena.	<p>Check if the heat pumps starts, if the supply temperature rises quickly whilst nothing happens to the return temperature.</p> <p>If this happens and the heat pump is stopped by the hysteresis function to later drop in temperature (supply) as quickly to start again, but cannot due to time conditions in regulation, this means that the heat pump cannot transport the heat away from the condenser as it should.</p> <p>In such a case, hysteresis starts and stops the heat pump often.</p>	Adjust ROOM and CURVE if necessary, ensure that there is sufficient flow over the condenser and the heating circuit.

Problem – Connection of external AH

Cause	Troubleshooting	Remedy
Incorrectly connected auxiliary heater. Does not start when the control computer gives the signal.	Check the connection against the instructions/wiring diagram. Test the function in manual mode.	If the auxiliary heater is incorrectly connected, reconnect according to the instructions.

15.4.7 Outdoor unit

Problem – Noise/loud noise

Cause	Troubleshooting	Remedy
1. Positioning the outdoor unit.	Determine whether the outdoor unit can be moved to a more suitable location.	When positioning the outdoor unit, its direction does not affect its performance. The outdoor unit does not need to be positioned as close to the heat pump as necessary, it can be positioned as far as 30 "pipe metres" way.
2. Connection/wall lead-ins.	Check that the unit is installed according to the instructions. Is the outdoor unit secured to the wall?	Rigid mountings can generate noise from the outdoor section via walls in the house.

Problem – Defrosting problems

Cause	Troubleshooting	Remedy
1. Location/calibration of the outdoor sensor.	Check that the outdoor sensor is installed according to the installation instructions and that it is correctly calibrated.	Install according to the instructions and calibrate, if necessary. Alternatively, the outdoor sensor can be located behind the outdoor unit 20 cm out from the rear side of the outdoor unit.
2. Brine temperature in/out.	Measurement check the temperatures with a thermometer.	If necessary, calibrate BRINE IN and BRINE OUT in the heat pump's control computer.
3. The defroster shunt does not regulate as it should.	Manually test to check if the defroster shunt opens and closes the flow over the defroster tank. If the motor switches position when testing, but defrosting still does not function, remove the motor and try closing and opening the valve by hand by pressing in the control arm.	If the motor is defective, replace it. If the insert jams, remove and clean/lubricate it, or replace it.

Problem – Build-up of ice under and around the outdoor unit

Cause	Troubleshooting	Remedy
Insufficient drainage.	Does a lot of ice accumulate under and around the outdoor unit because the melted water has no where to run?	Drain the ground under and around the outdoor section or Install a drip tray with a drainpipe routed to an indoor drain or gully. NOTE! A heating cable may have to be installed in the drainpipe.

Problem – Water run-off by the outdoor unit, risk of moisture problems in house foundations

Cause	Troubleshooting	Remedy
Insufficient drainage.	During some periods when the outdoor unit is being defrosted, large amounts (20-40 L/day) of water can run off.	Drain the ground under and around the outdoor unit so that it can cope with the extra amount of water produced because of defrosting or Install a drip tray with a drainpipe routed to an indoor drain or gully. NOTE! A heating cable may have to be installed in the drainpipe.

